



US008998205B2

(12) **United States Patent**
Nakahata et al.

(10) **Patent No.:** **US 8,998,205 B2**
(45) **Date of Patent:** **Apr. 7, 2015**

(54) **RECORDING APPARATUS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/224,905**

(22) Filed: **Mar. 25, 2014**

(65) **Prior Publication Data**

US 2014/0291927 A1 Oct. 2, 2014

(30) **Foreign Application Priority Data**

Mar. 29, 2013 (JP) 2013-072352

(51) **Int. Cl.**

B65H 5/00 (2006.01)

B65H 5/06 (2006.01)

(52) **U.S. Cl.**

CPC **B65H 5/068** (2013.01)

(58) **Field of Classification Search**

USPC 271/184–186, 225, 264; 399/110, 124,
399/125; 347/108, 109

See application file for complete search history.

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(57) **ABSTRACT**

A recording apparatus includes an apparatus main body, and a unit body that forms a medium transportation path, and is configured to be attachable and detachable with respect to the apparatus main body. The unit body includes a feeding roller that transports a medium, and a driven transportation unit that transmits the drive force of the drive transportation unit to the feeding roller. The unit body is displaceable between a first position at which the driven transportation unit is connected to the drive transmission unit and a second position at which the driven transportation unit is separated from the drive transmission unit. When a user pulls out the medium, the unit body retained at the first position moves from the first position to the second position.

11 Claims, 15 Drawing Sheets

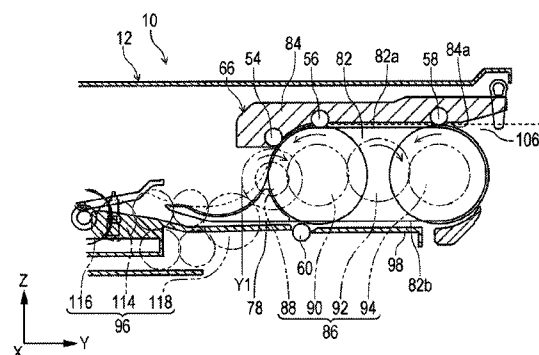
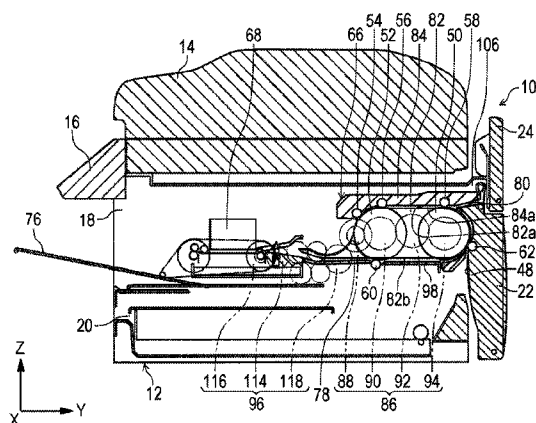


FIG. 1

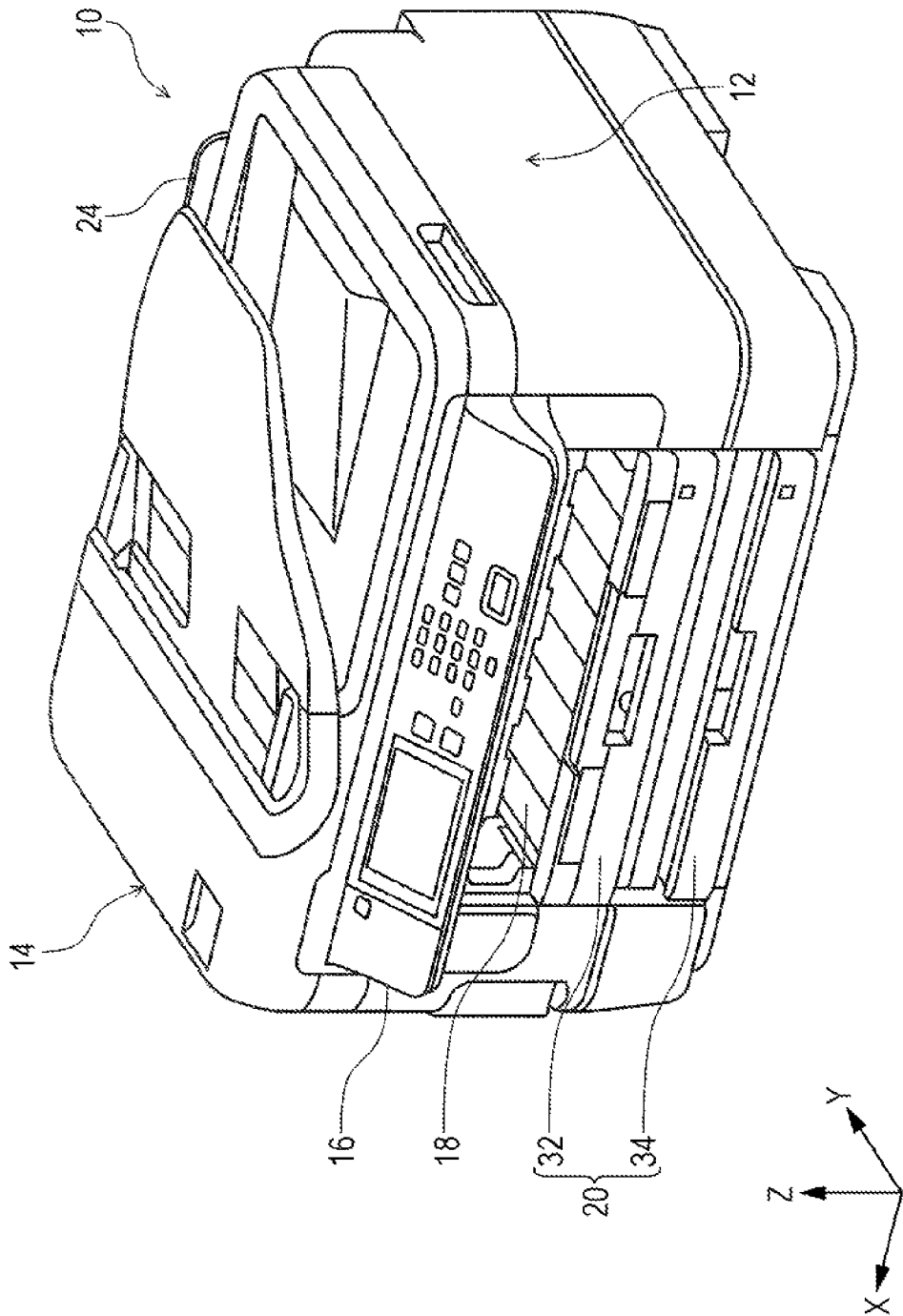


FIG. 2

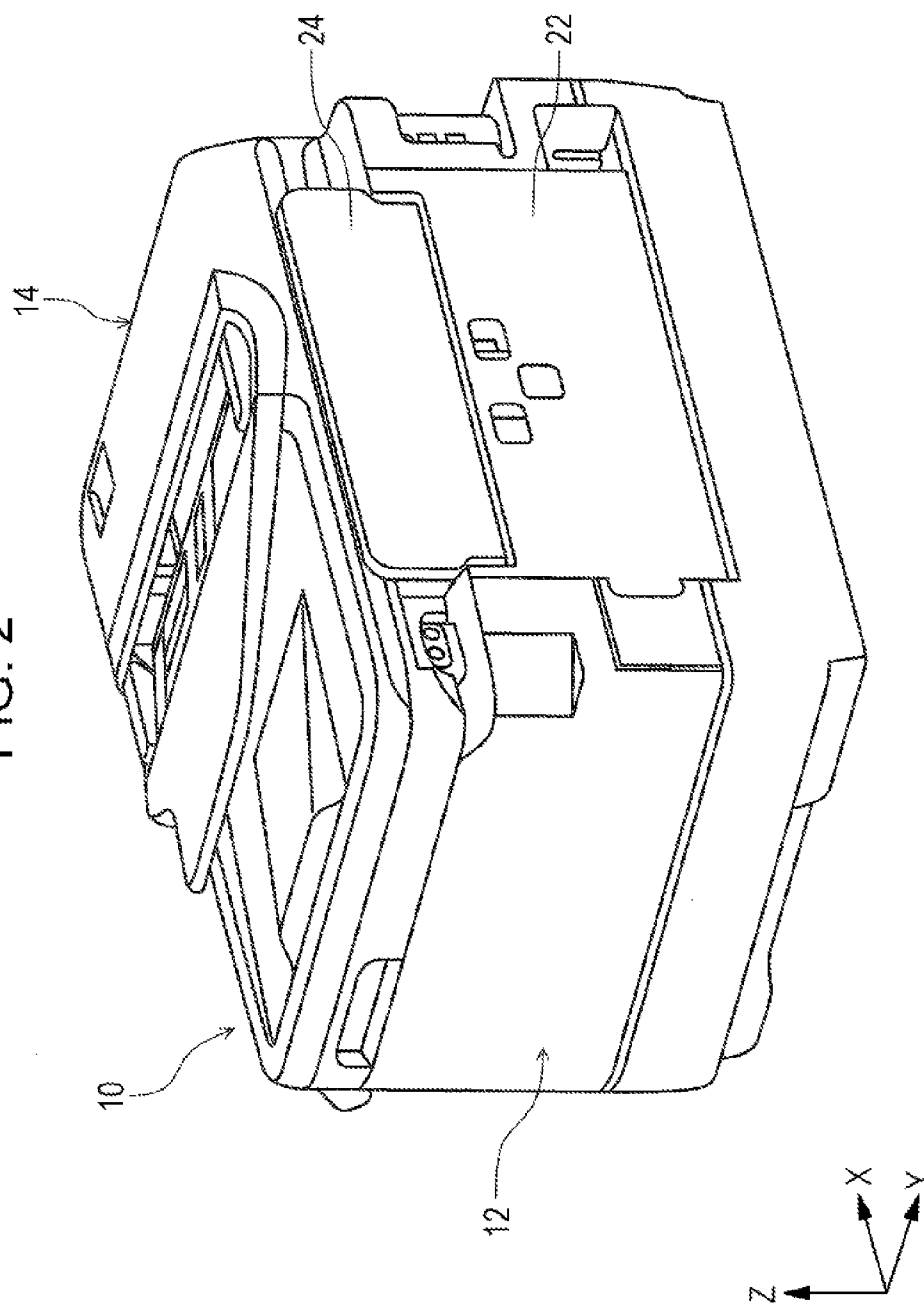


FIG. 3

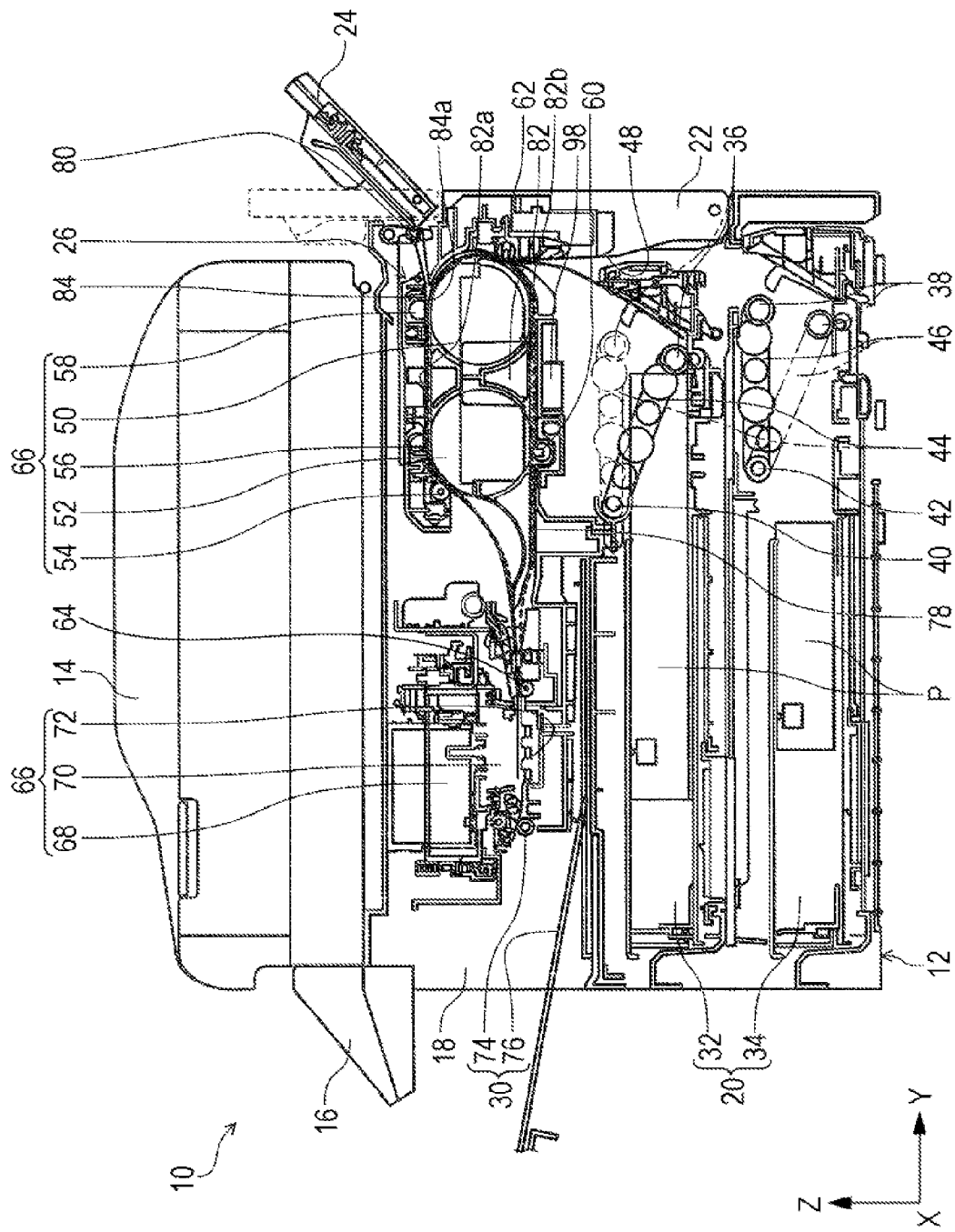


FIG. 4

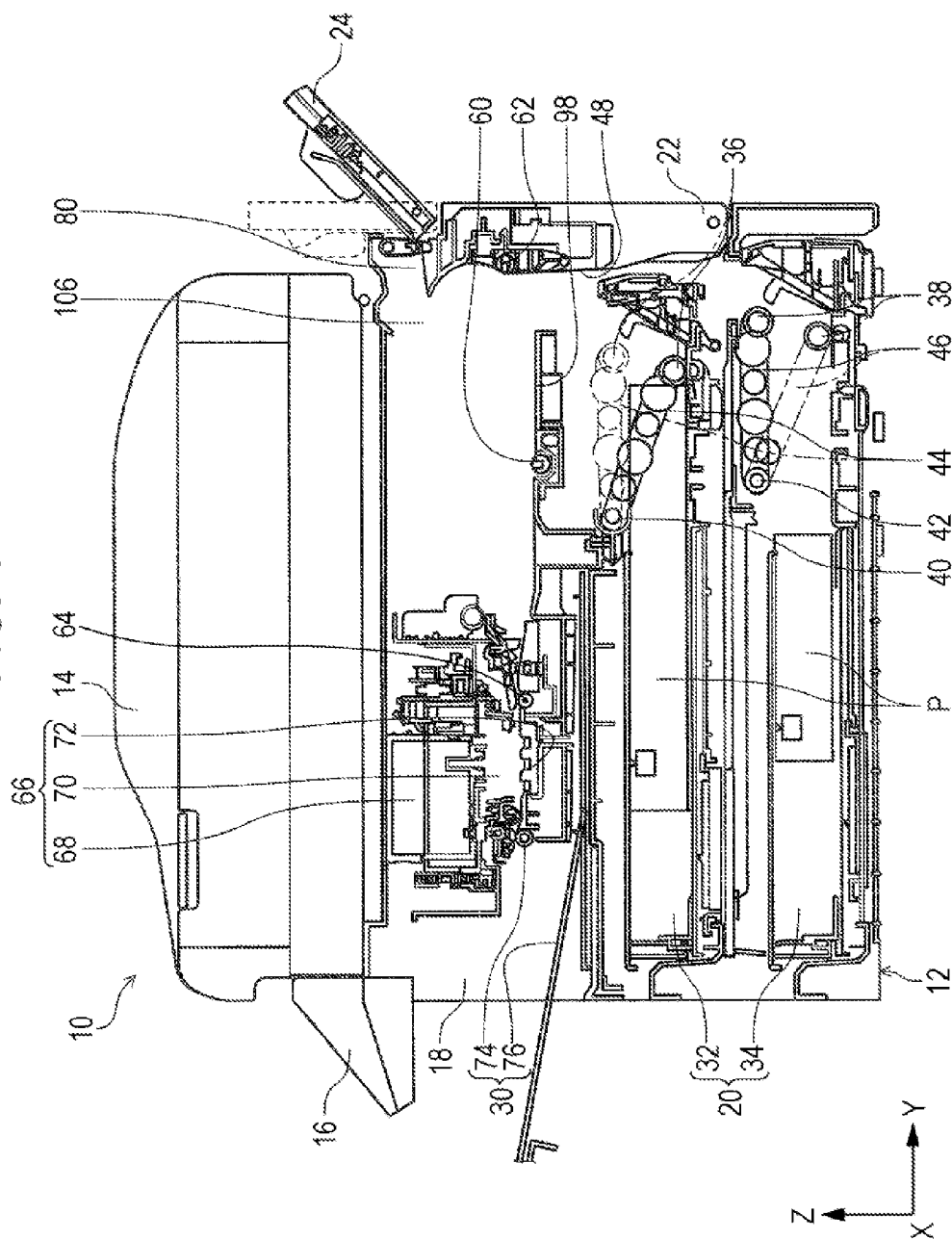


FIG. 5

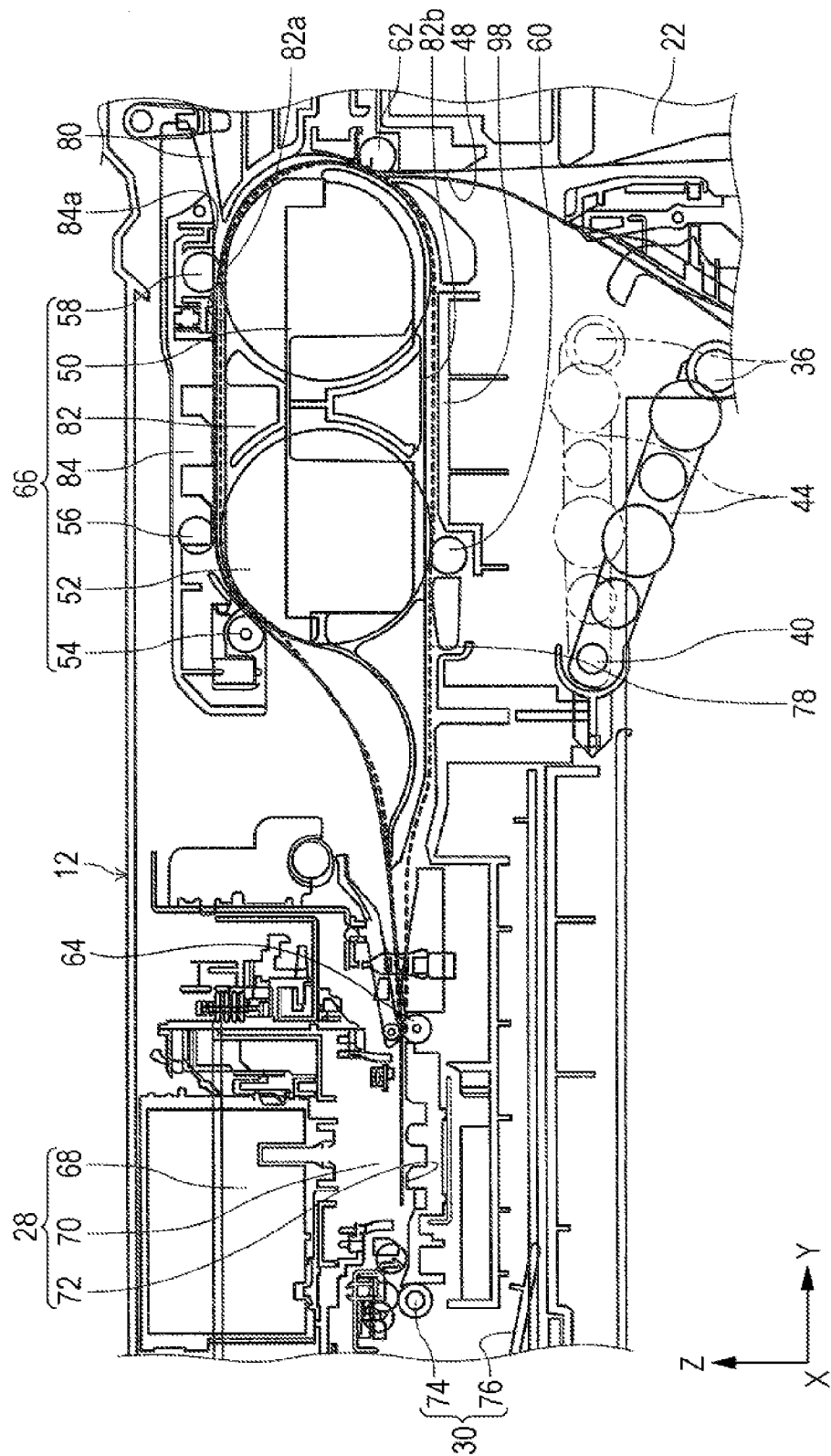


FIG. 6

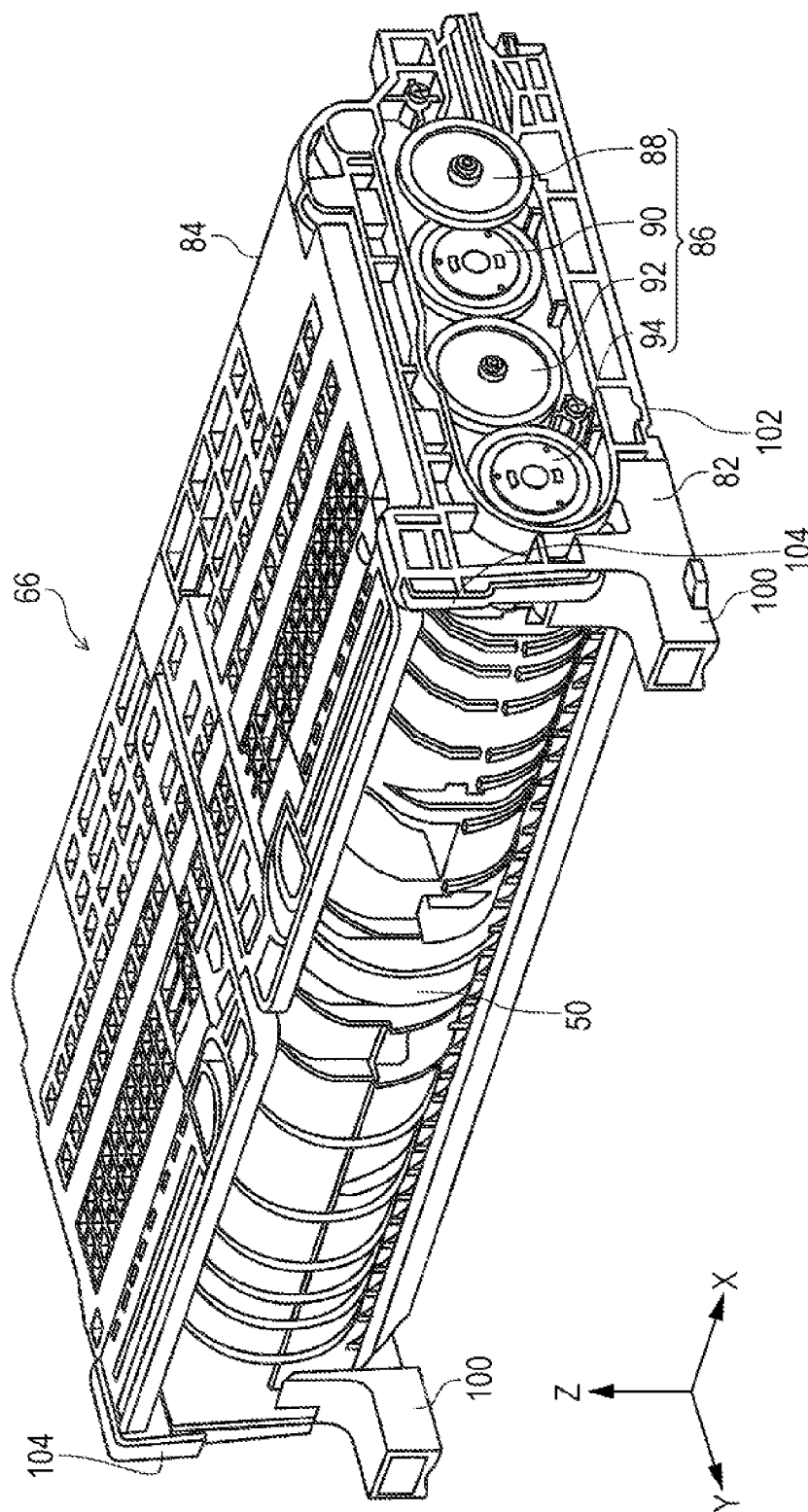


FIG. 7A

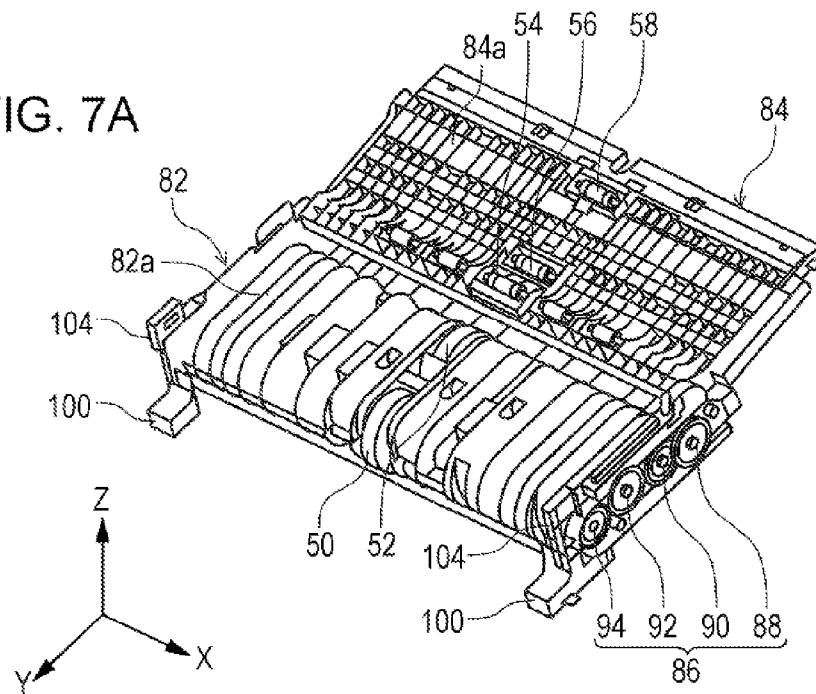
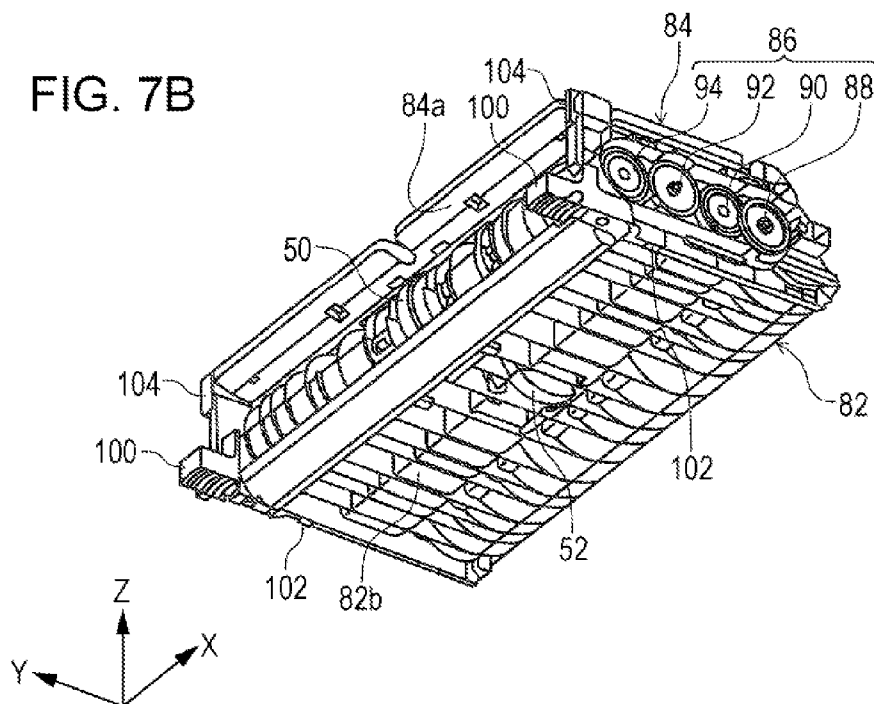


FIG. 7B



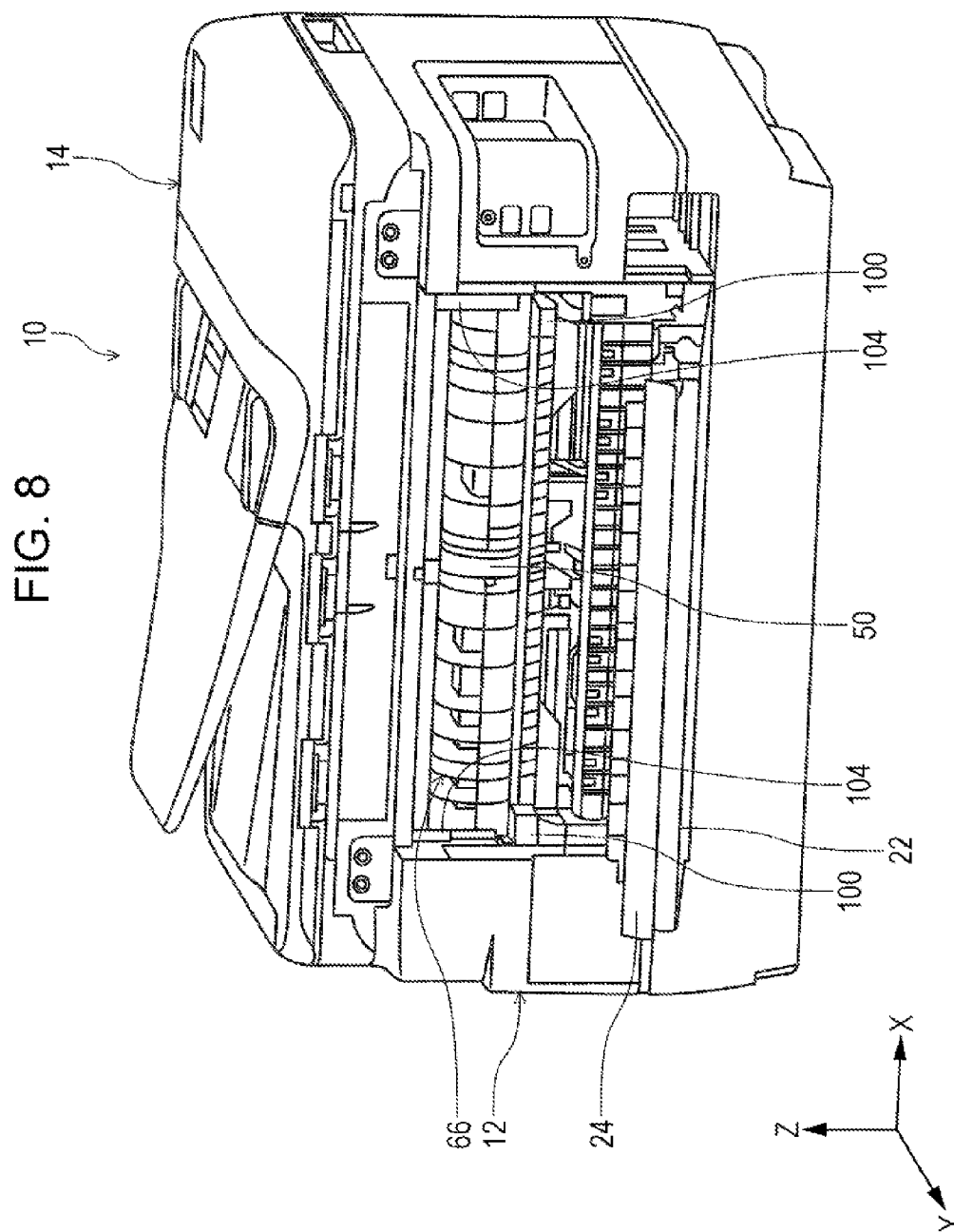


FIG. 9A

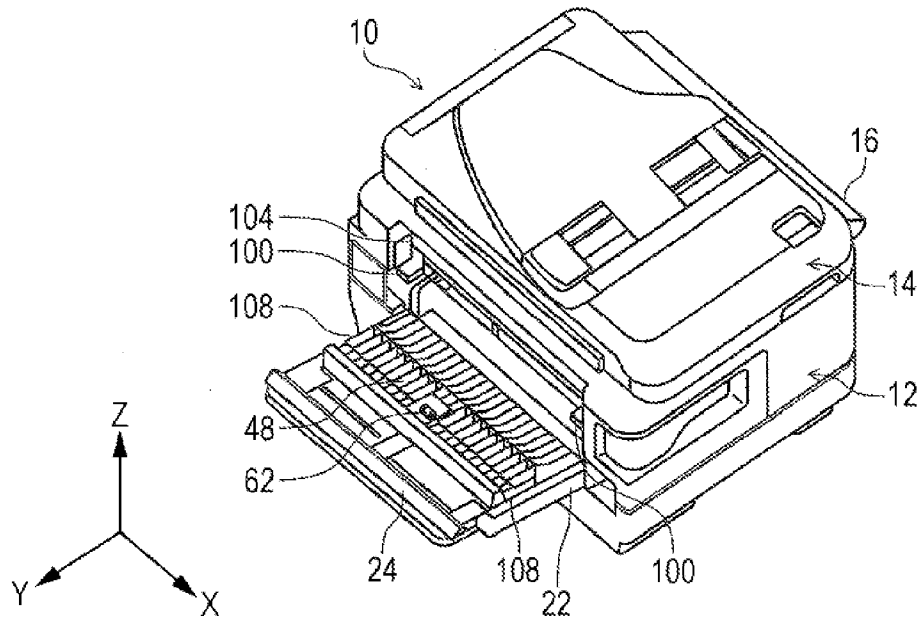


FIG. 9B

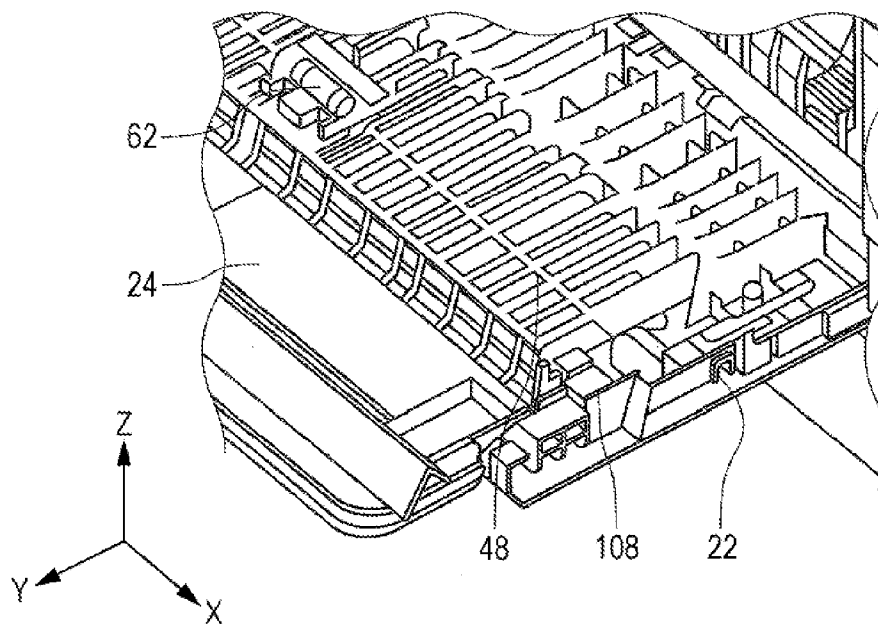


FIG. 10A

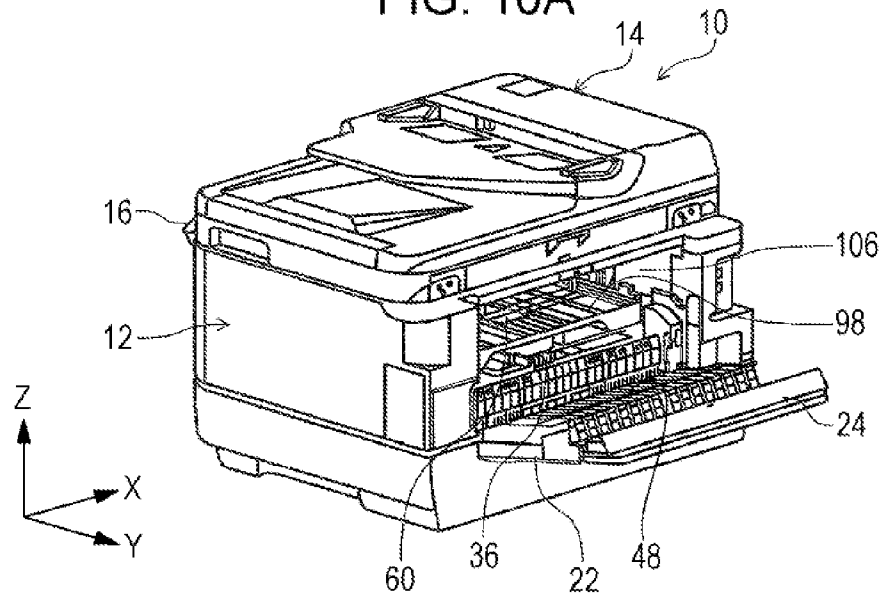


FIG. 10B

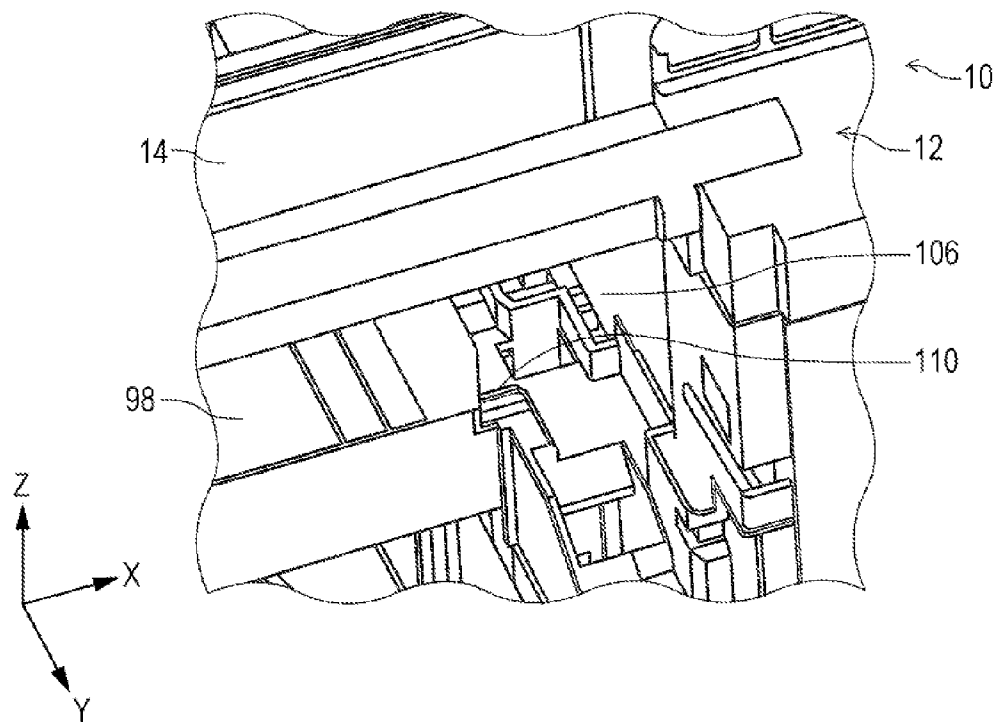


FIG. 11A

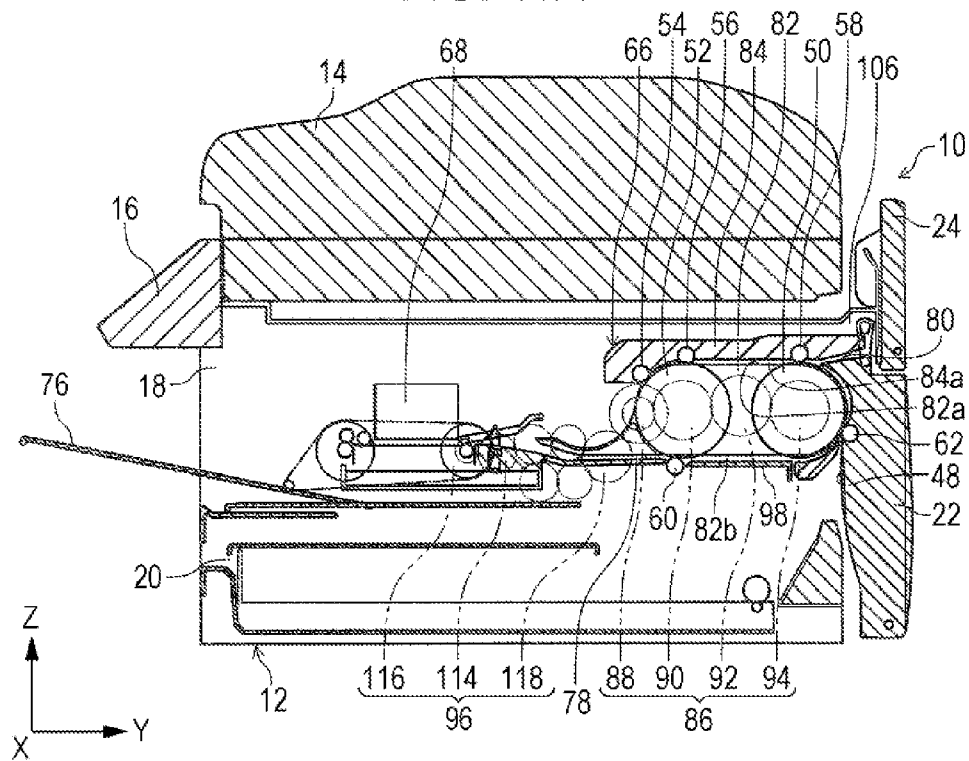


FIG. 11B

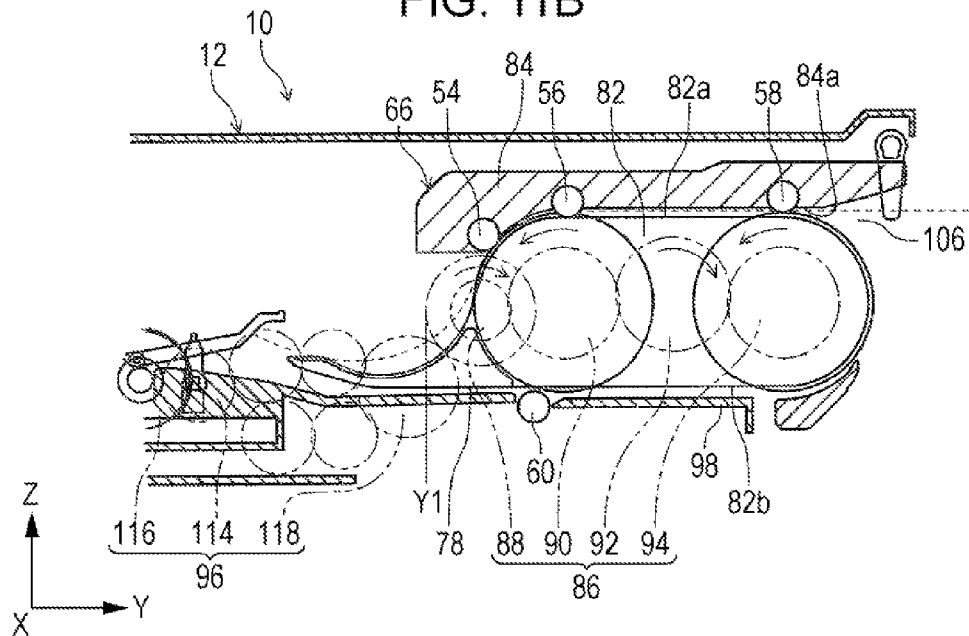


FIG. 12A

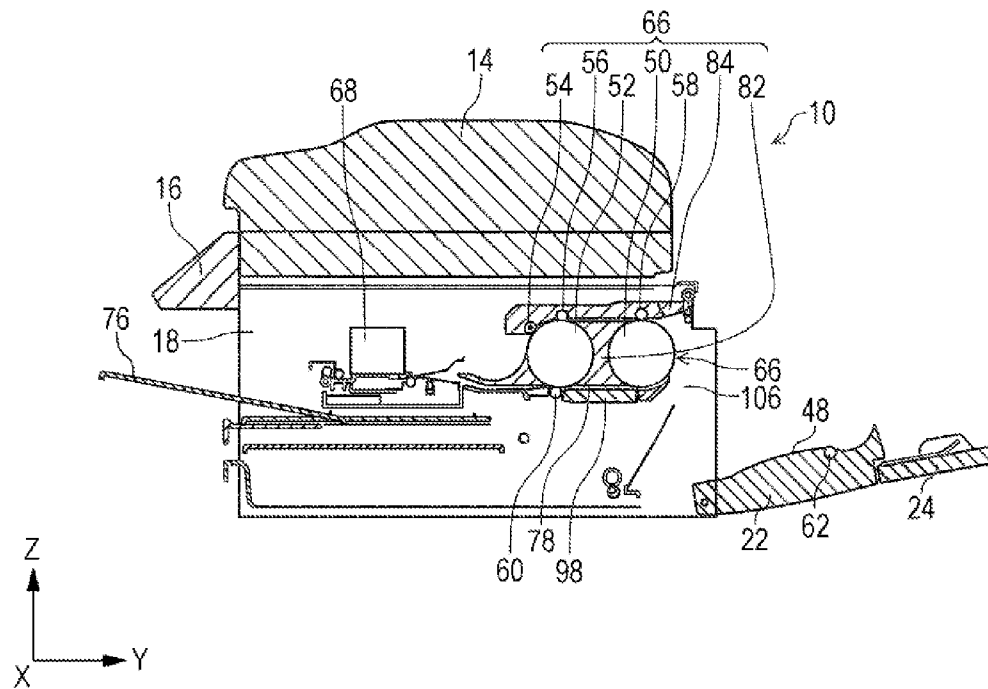
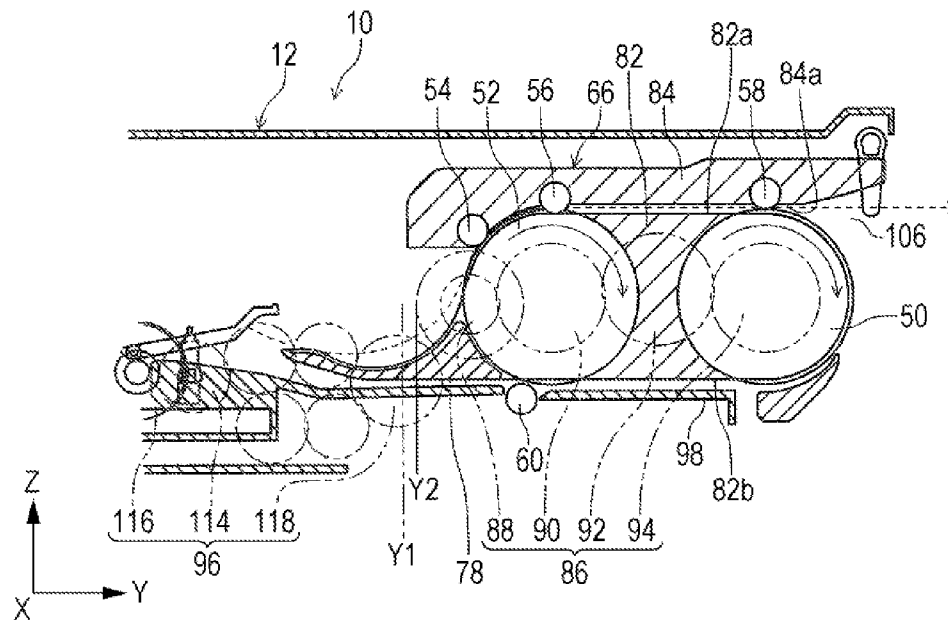


FIG. 12B



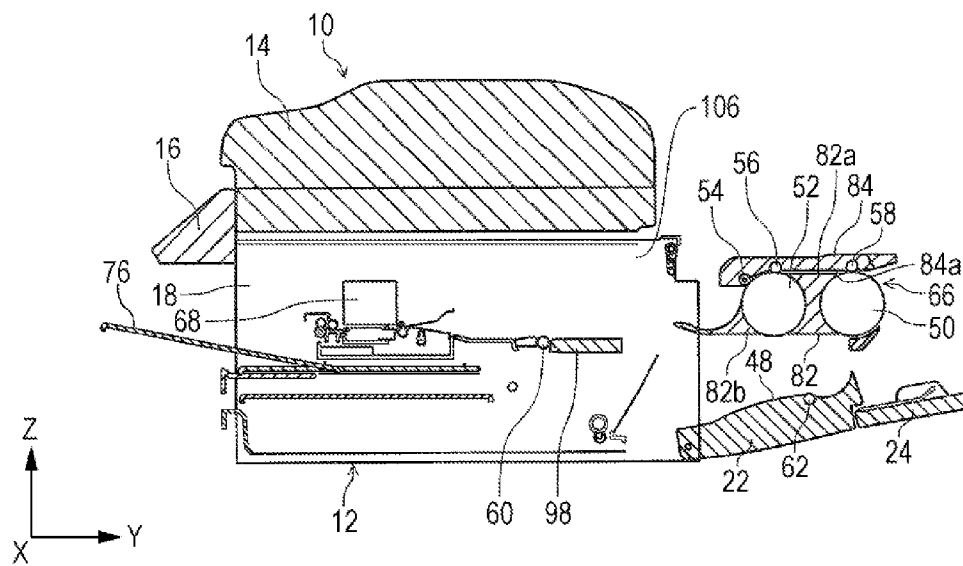


FIG. 14

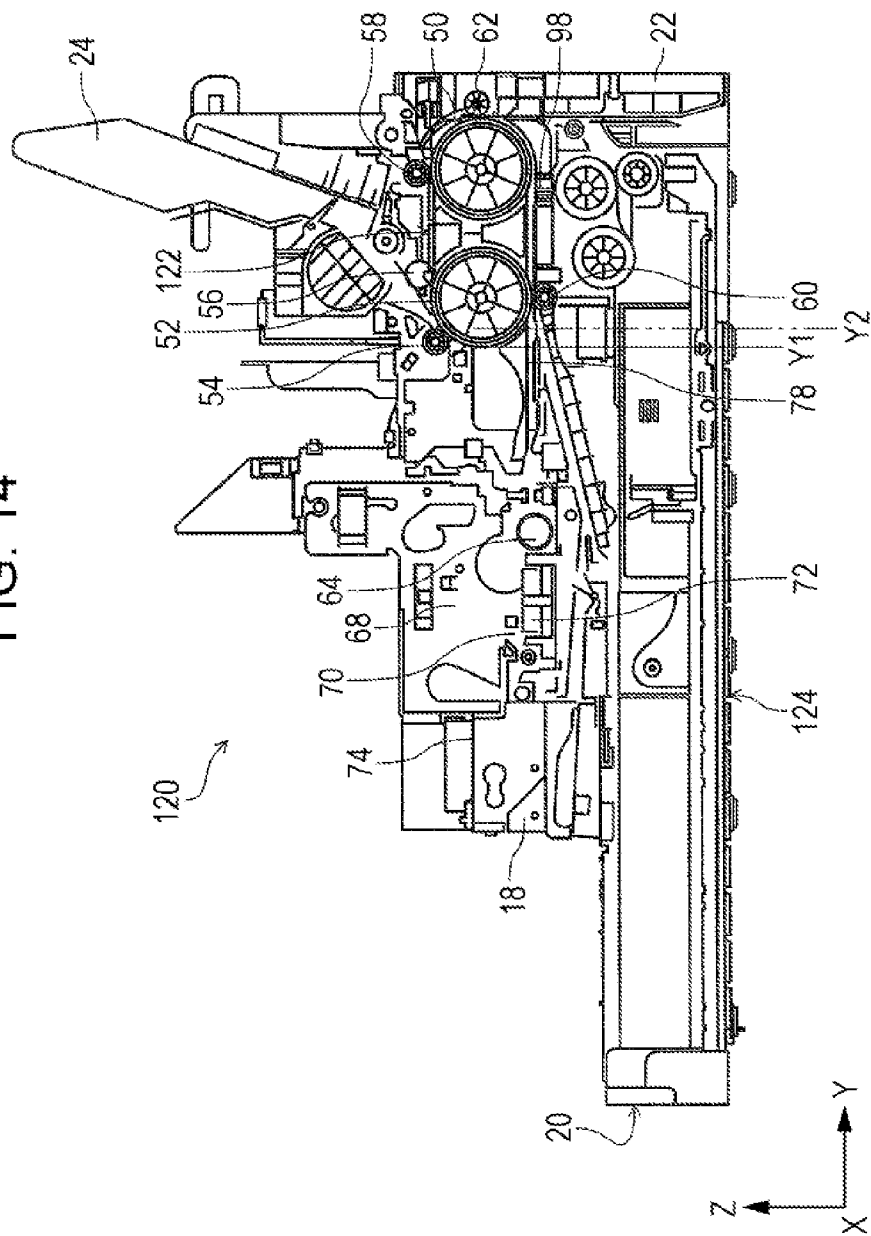
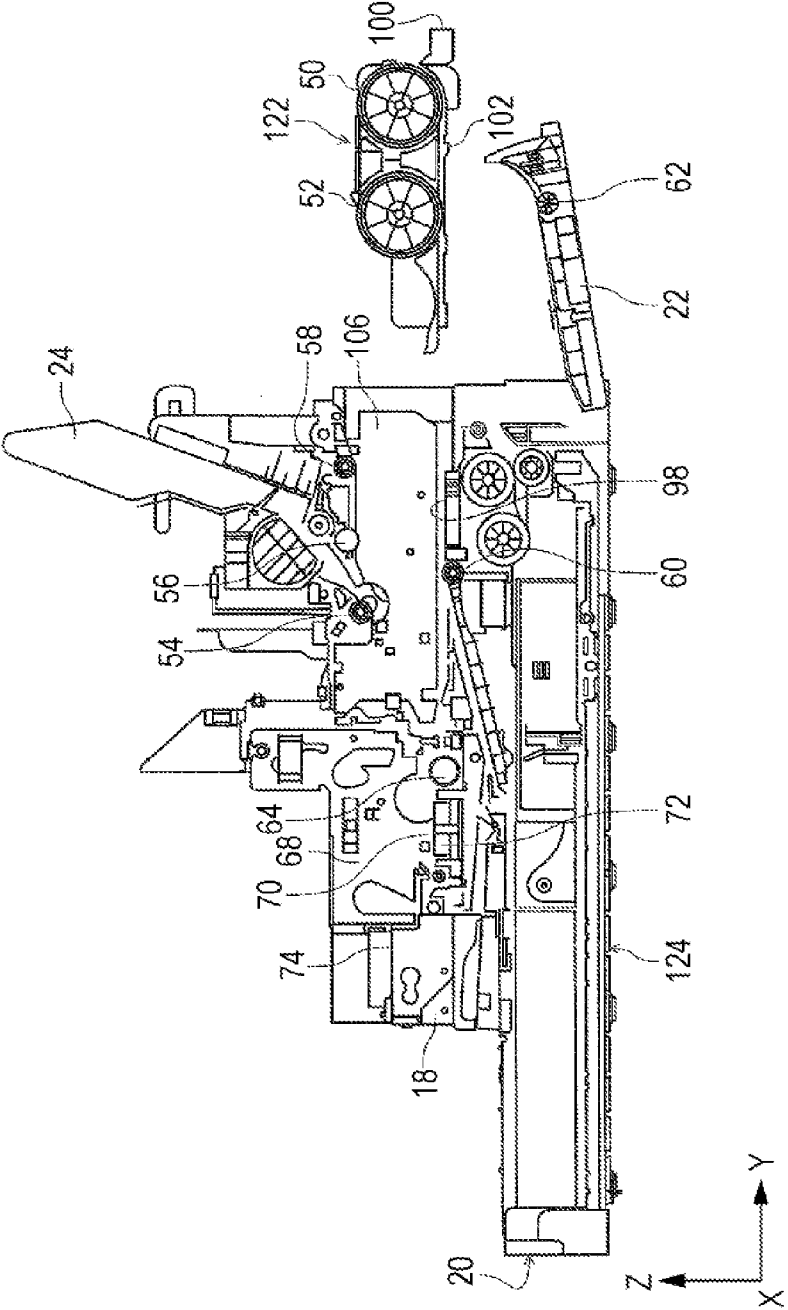


FIG. 15



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RECORDING APPARATUS

BACKGROUND

1. Technical Field

The present invention relates to a recording apparatus that is represented by a facsimile, a printer or the like.

2. Related Art

In a recording apparatus that is represented by a facsimile, a printer or the like, since recording paper as an example of a medium is jammed in a transportation path (referred to as a paper jam or the like), JP-A-2007-279298 proposes an image formation apparatus having a configuration in which when the paper jam occurs, nipping of the paper is released in conjunction with an opening of a rear cover so that the jammed paper can be easily removed.

A recording apparatus disclosed in JP-A-2012-240813 has the following configuration. An inversion roller forms an inverted path through which recording paper is inverted, and the inverted path is provided in a bending inversion unit that is attachable and detachable with respect to the recording apparatus main body. When the bending inversion unit is detached from the recording apparatus, a paper transportation path inside the apparatus is exposed.

However, in the image formation apparatus disclosed in JP-A-2007-279298, the configuration to release the nipping of the paper at multiple positions becomes complicated. Accordingly, there is a problem in that the nipping of the paper can be released at limited positions and thus, workability in a paper jam release process deteriorates.

In the recording apparatus disclosed in JP-A-2012-240813, there is a problem in that when a user performs a paper jam release process, it is necessary for the user to detach the bending inversion unit, and the workability deteriorates. There is a problem in that in a state where a part of the paper is nipped by roller provided on a side of the bending inversion unit and the other part is nipped by rollers provided on a side the apparatus main body, when the bending inversion unit is pulled out, the paper can be ripped.

SUMMARY

An advantage of some aspects of the invention is to provide a recording apparatus capable of more easily performing a paper jam release operation and preventing a configuration of the apparatus from being complicated in conjunction with improvement of workability in a paper jam release process.

The recording apparatus according to an aspect of the invention includes an apparatus main body that has a recording head which performs recording on a medium; and a unit body that forms a medium transportation path through which the medium is transported, and is configured to be attachable and detachable with respect to the apparatus main body. The unit body includes a feeding roller that transports the medium; a driven roller that nips the medium between the feeding roller and the driven roller; and a driven transportation unit that is connected to a drive transportation unit which is provided on a side of the apparatus main body to transmit a drive force, and that transmits the drive force of the drive transportation unit to the feeding roller. In a state where the unit body is mounted on the apparatus main body, the unit body is displaceable between a first position at which the driven transmission unit is connected to the drive transmission unit and a second position at which the driven transmission unit is separated from the drive transmission unit, that is, the unit body is pulled out with respect to the first position. When a user pulls out the medium of which a part appears on

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an outside of the unit body in a state where the medium is nipped by the feeding roller and the driven roller, the unit body retained at the first position moves from the first position to the second position.

According to the aspect, in a state where the unit body is mounted on the apparatus main body, the unit body having the feeding roller that transports the medium is displaceable between the first position at which the driven transmission unit is connected to the drive transmission unit and the second position at which the driven transmission unit is separated from the drive transmission unit, that is, the unit body is pulled out with respect to the first position. Accordingly, a drive force is not transmitted to the unit body at the second position. That is, since the feeding roller provided on the unit body is freely rotatable, it is possible to easily pull out the medium in contact with the feeding roller, and it is possible to easily perform a paper jam release operation.

In addition, even in a case where the medium is nipped at multiple positions, when only a connection between the drive transmission unit and the driven transmission unit is released, a drive force is not transmitted to the entirety of the unit body, that is, each of the rollers is freely rotatable at the multiple nipping positions of the medium. In a configuration in which the medium is nipped at multiple positions, it is possible to avoid complexity of the structure and to easily remove medium.

When a user pulls out the medium of which a part appears on an outside of the unit body in a state where the medium is nipped by the feeding roller and the driven roller, the unit body retained at the first position moves from the first position to the second position. Accordingly, it is not necessary for the user to move the unit body from the first position to the second position, and good workability is obtained.

The recording apparatus according to the aspect of the invention may further include a retention unit that retains the unit body at the second position against an operation of pulling out the medium.

According to the aspect, since the recording apparatus includes the retention unit that retains the unit body at the second position against the operation of pulling out the medium, the retention unit may prevent the unit body from unintentionally returning to the first position during a medium jam release operation.

In the recording apparatus according to the aspect of the invention, when a user pulls out the medium that is nipped by the feeding roller and the driven roller in a state where the unit body is retained at the second position, the retention of the unit body at the second position may be maintained, and the medium may be pulled out from between the feeding roller and the driven roller.

According to the aspect, since a force of retaining the unit body at the second position is larger than a force of pulling out the medium from the unit body, when the medium is pulled out from the unit body, it is possible to avoid such a problem that the unit body is also pulled out from the apparatus main body while being accompanied by the medium.

In the recording apparatus according to the aspect of the invention, the retention unit may be configured to include a protrusion that is provided on one of the apparatus main body and the unit body; and a sloping surface that is provided on the other of the apparatus main body and the unit body, which is not provided with the protrusion, to engage with the protrusion. When a pullout force equal to or larger than a predetermined magnitude is exerted on the unit body, the protrusion may climb over the sloping surface and thus, the retention of the unit body may be released from the second position.

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According to the aspect, if a pullout force equal to or larger than a predetermined magnitude is applied to the unit body, it is possible to pull out the unit body. Accordingly, when the unit body is pulled out, good workability is obtained compared to a configuration in which the unit body is completely locked at the second position.

In the recording apparatus according to the aspect of the invention, the unit body may include an openable and closeable cover that has the driven roller, and when the cover is open, the driven roller separates from the feeding roller.

According to the aspect, the unit body includes the openable and closeable cover that has the driven roller, and when the cover is open, the driven roller separates from the feeding roller. Accordingly, when the cover is open, it is possible to easily remove the medium, for example, a small piece of the medium, jammed inside the unit body.

In the recording apparatus according to the aspect of the invention, the unit body may be mounted on a mounting section that is exposed when an openable and closeable opening/closing body provided on the apparatus main body is open.

According to the aspect, since the unit body is mounted on the mounting section that is exposed when the openable and closeable opening/closing body provided on the apparatus main body is open, it is possible to prevent a user from unintentionally dropping the unit body. Since the unit body is not configured to have a member forming an exterior of the apparatus main body as an element, that is, the opening/closing body and the unit body are separately configured, it is possible to reduce the weight of the unit body, and to obtain good workability when attaching and detaching the unit body with respect to the apparatus main body.

A recording apparatus according to another aspect of the invention includes an apparatus main body that has a recording head which performs recording on a medium; and a unit body that forms a medium transportation path through which the medium is transported, and is configured to be attachable and detachable with respect to the apparatus main body. The unit body is mounted on a mounting section that is exposed when an openable and closeable opening/closing body provided on the apparatus main body is open. The unit body includes a feeding roller that transports the medium; and a driven transportation unit that is connected to a drive transportation unit which is provided on a side of the apparatus main body to transmit a drive force, and that transmits the drive force of the drive transportation unit to the feeding roller. In a state where the unit body is mounted on the apparatus main body, the unit body is displaceable between a first position at which the driven transmission unit is connected to the drive transmission unit and a second position at which the driven transmission unit is separated from the drive transmission unit, that is, the unit body is pulled out with respect to the first position. When the opening/closing body is closed, the unit body is retained at the first position by the opening/closing body. When the opening/closing body is open, the unit body is displaced from the first position to the second position.

According to the aspect, when the opening/closing body is closed, the unit body is retained at the first position by the opening/closing body. When the opening/closing body is open, the unit body is displaced from the first position to the second position. Accordingly, it is not necessary for the user to move the unit body from the first position to the second position, and good workability is obtained.

In the recording apparatus according to the aspect, when the opening/closing body is open, at least a part of the feeding roller may be exposed.

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According to the aspect, when the opening/closing body is open, a part of the feeding roller is exposed, thereby causing a jammed medium to be further exposed. Accordingly, it is possible to more easily perform a paper jam release operation.

In the recording apparatus according to the aspect, the feeding roller may be a roller that inverts the medium fed from a side of the recording head by using an outer circumferential surface thereof. The unit body may include a second feeding roller of which an outer circumferential surface is in contact with medium transportation paths before and after the medium is inverted by the feeding roller and which exerts a transportation force on the medium.

According to the aspect, the unit body includes the feeding roller as a roller (hereinafter, referred to as a "inversion roller") that inverts the medium, and the second feeding roller of which the outer circumferential surface is in contact with the medium transportation paths before and after the medium is inverted by the inversion roller and which exerts a transportation force on the medium. Accordingly, the diameter of the inversion roller can be prevented from becoming large, and it can be ensured that the inverted path has sufficient length for the second feeding roller to invert the medium.

Since the second feeding roller is in contact with the medium transportation paths before and after the medium is inverted by the inversion roller and exerts a transportation force on the medium, one roller (the second feeding roller) contributes to formation of the medium transportation paths before and after the medium is inverted. Accordingly, it is possible to reduce the number of the rollers that are disposed, and to suppress an increase in cost.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described with reference to the accompanying drawings, wherein like numbers reference like elements.

FIG. 1 is a perspective view of a printer according to the invention.

FIG. 2 is a rear perspective view of the printer according to the invention.

FIG. 3 is a cross-sectional side view illustrating a paper transportation path of the printer according to the invention.

FIG. 4 is a cross-sectional side view illustrating a state where a transportation unit is detached from the paper transportation path of the printer according to the invention.

FIG. 5 is an enlarged view illustrating the vicinity of the transportation section in the paper transportation path of the printer according to the invention.

FIG. 6 is a perspective view of the transportation unit according to the invention.

FIG. 7A is a perspective view illustrating a state where the paper transportation path in the transportation unit is open.

FIG. 7B is a perspective view when the transportation unit is seen from below.

FIG. 8 is a rear perspective view illustrating a state where a back surface cover of the printer according to the invention is open.

FIG. 9A is a perspective view when the printer according to the invention is seen from above in a state where the back surface cover is open.

FIG. 9B is an enlarged view of the back surface cover in FIG. 9A.

FIG. 10A is a rear perspective view illustrating a state where the transportation unit is detached from the printer.

FIG. 10B is an enlarged perspective view illustrating a stopper section provided on the printer.

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FIG. 11A is a view illustrating a power transmission path of the transportation unit according to the invention.

FIG. 11B is an enlarged view of the transportation unit in FIG. 11A.

FIG. 12A is a cross-sectional side view illustrating a state where the back surface cover of the printer according to the invention is open.

FIG. 12B is a cross-sectional side view illustrating a state where power transmission in the power transmission path of the transportation unit is disconnected.

FIG. 13A is a cross-sectional side view illustrating states of the transportation unit and the stopper section of the printer in FIG. 12B.

FIG. 13B is a cross-sectional side view illustrating a state where the transportation unit is detached from the printer.

FIG. 14 is a cross-sectional side view of a printer to which a transportation unit is attached in a second embodiment.

FIG. 15 is a cross-sectional side view of the printer from which the transportation unit is detached in the second embodiment.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

Hereinafter, embodiments of the invention will be described with reference to the accompanying drawings. In each of the embodiments, the same reference signs will be assigned to the same configurations. The configurations will be described only in a first embodiment, and will not be described in another embodiment.

FIG. 1 is a perspective view of a printer according to the invention. FIG. 2 is a rear perspective view of the printer according to the invention. FIG. 3 is a cross-sectional side view illustrating a paper transportation path of the printer according to the invention. FIG. 4 is a cross-sectional side view illustrating a state where a transportation unit is detached from the paper transportation path of the printer according to the invention. FIG. 5 is an enlarged view illustrating the vicinity of the transportation section in the paper transportation path of the printer according to the invention. FIG. 6 is a perspective view of the transportation unit according to the invention. FIG. 7A is a perspective view illustrating a state where the paper transportation path in the transportation unit is open. FIG. 7B is a perspective view when the transportation unit is seen from below.

FIG. 8 is a rear perspective view illustrating a state where a back surface cover of the printer according to the invention is open. FIG. 9A is a perspective view when the printer according to the invention is seen from above in a state where the back surface cover is open. FIG. 9B is an enlarged view of the back surface cover in FIG. 9A. FIG. 10A is a rear perspective view illustrating a state where the transportation unit is detached from the printer. FIG. 10B is an enlarged perspective view illustrating a stopper section provided on the printer. FIG. 11A is a view illustrating a power transmission path of the transportation unit according to the invention. FIG. 11B is an enlarged view of the transportation unit in FIG. 11A.

FIG. 12A is a cross-sectional side view illustrating a state where the back surface cover of the printer according to the invention is open. FIG. 12B is a cross-sectional side view illustrating a state where power transmission in the power transmission path of the transportation unit is disconnected. FIG. 13A is a cross-sectional side view illustrating states of the transportation unit and the stopper section of the printer in FIG. 12B. FIG. 13B is a cross-sectional side view illustrating a state where the transportation unit is detached from the printer. FIG. 14 is a cross-sectional side view of a printer to

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which a transportation unit of a second embodiment is attached. FIG. 15 is a cross-sectional side view of the printer from which the transportation unit of the second embodiment is detached.

In FIGS. 3 and 4, substantially all rollers are drawn on the same drawing sheet to illustrate the rollers disposed in the paper transportation path of a printer 10. However, the rollers are not always coincidentally positioned in a depth direction (in a front and back direction of a drawing sheet in a FIG. 3) of the printer 10 (some rollers are coincidentally positioned in the depth direction thereof). In an X, Y and Z coordinate system of each drawing, an X direction indicates a scanning direction of a recording head, a Y direction indicates a depth direction of a recording apparatus, and a Z direction indicates a height direction of the printer. In each drawing, a -Y direction indicates a front surface side of the apparatus, and a +Y direction indicates a back surface side thereof.

FIGS. 1 and 2 illustrate the printer 10 according to the invention. The printer 10 includes an apparatus main body 12, and a manuscript scanning apparatus 14 that is provided on an upper portion of the apparatus main body 12 to be rotationally movable with respect to the apparatus main body 12. The apparatus main body 12 includes an operation panel section 16 which is provided on the front surface side (on a side of the -Y direction in FIG. 1) of the apparatus, and through which a user operates the printer 10; a discharge port 18 that is open toward the front surface side of the apparatus; and medium containers 20 that are disposed under the discharge port 18.

The apparatus main body 12 includes a back surface cover 22 on the back surface side (on a side of the +Y direction in FIG. 2) of the apparatus as an opening/closing body that is configured to be rotationally movable with respect to the apparatus main body 12. In FIG. 2, the back surface cover 22 is closed with respect to the apparatus main body 12. The back surface cover 22 includes a medium support tray 24 that is rotationally movably connected to a free end side of the back surface cover 22, that is, a side opposite to a rotationally moving shaft thereof to be described later.

Subsequently, in the printer 10, a transportation path of paper P as a "medium" will be described with reference to FIGS. 3 and 5. The printer 10 includes a medium container 20, a transportation section 26, a recording section 28 and a discharge section 30 in the apparatus main body 12.

The medium container 20 includes an upper stage tray 32 that is positioned on an upper side in the Z direction, and a lower stage tray 34 that is positioned below the upper stage tray 32. The upper stage tray 32 and the lower stage tray 34 are configured in such a manner that the upper stage tray 32 and the lower stage tray 34 can be mounted onto and detached from the apparatus main body 12 from a front side (the -Y direction in FIG. 3) of the apparatus.

Each of the upper stage tray 32 and the lower stage tray 34 contains a plurality of the paper P. In the embodiment, each of the upper stage tray 32 and the lower stage tray 34 contains a different type of paper, but in a case where it is not particularly necessary to distinguish the types of the paper from each other, the paper is referred to as the "paper P". The paper P is an example of the medium.

Pickup rollers 36 and 38 that are rotationally driven by driving sources which are not illustrated are respectively provided above the upper stage tray 32 and the lower stage tray 34. The pickup rollers 36 and 38 are respectively provided on rocking members 44 and 46 that respectively rock about rocking shafts 40 and 42.

When the paper P contained in the upper stage tray 32 is fed to a downstream side of the transportation path based on an instruction input from the operation panel section 16, the

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pickup roller **36** rotates in contact with the uppermost paper **P** contained in the upper stage tray **32** and thus, the uppermost paper **P** is fed from the upper stage tray **32** to the downstream side of the transportation path. Similarly, when the paper **P** contained in the lower stage tray **34** is fed to the downstream side of the transportation path, the pickup roller **38** rotates in contact with the uppermost paper **P** contained in the lower stage tray **34** and thus, the uppermost paper **P** is fed from the lower stage tray **34** to the downstream side of the transportation path.

When the back surface cover **22** is closed with respect to the apparatus main body **12**, an inner surface of the back surface cover **22** forms a part of the transportation path of the paper **P**. That is, a feeding path section **48** formed on an inside of the back surface cover **22** guides the paper **P** fed from the upper stage tray **32** and the lower stage tray **34** to the transportation section **26**.

The transportation section **26** includes a first roller **50** as a “first feeding roller”; a second roller **52** as a “second feeding roller”; and a first transportation driven roller **54**, a second transportation driven roller **56**, a third transportation driven roller **58**, a fourth transportation driven roller **60**, a fifth transportation driven roller **62**, and a pair of transportation rollers **64** as “driven rollers.”

Herein, a transportation unit **66** (refer to FIGS. **3**, **4** and **6**) that is attachable and detachable with respect to the apparatus main body **12** is configured to have the first roller **50**, the second roller **52**, the first transportation driven roller **54**, the second transportation driven roller **56** and the third transportation driven roller **58**. The transportation unit **66** as a “unit body” will be described later. In the embodiment, the first roller **50** and the second roller **52** are driven to rotate in a counter-clockwise direction by a common drive motor **116** to be described later.

The transportation section **26** will be described later. The paper **P** is transported to the transportation rollers **64** via the fifth transportation driven roller **62** and the third transportation driven roller **58** which are in contact with the first roller **50** along the transportation path in the transportation section **26**, and via the second transportation driven roller **56** and the first transportation driven roller **54** which are in contact with the second roller **52** along the transportation path in the transportation section **26**. The recording section **28** is provided in the transportation path on a downstream side of the transportation rollers **64** of the transportation section **26**.

The recording section **28** is provided in the transportation path on the downstream side of the transportation rollers **64** of the transportation section **26**. The recording section **28** includes a carriage **68** that can move in the scanning direction (in the **X** axis direction in FIG. **3**), a recording head **70** that is provided on a lower portion of the carriage **68** to eject ink on the paper **P**, and a platen **72** that is provided to face the recording head **70** and support the paper **P**.

The discharge section **30** is provided in the transportation path on the downstream side of the recording section **28**. The discharge section **30** is provided with a pair of discharge rollers **74**, and a discharge stacker **76** on which the paper **P** discharged from the discharge roller **74** is mounted and is provided on the front side (in the **-Y** direction) of the apparatus to protrude from the discharge port **18**. When the paper **P** is fed from the transportation section **26** to the recording section **28** along the transportation path, recording is performed on a first surface of the paper **P**. After the recording is completed, the paper **P** is nipped by the discharge roller **74**, and is discharged to the discharge stacker **76** that is provided on the front side of the apparatus.

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When the recording section **28** performs recording on both surfaces of the paper **P** in the printer **10**, the recording section **28** performs the recording on the first surface of the paper **P**, and then while a trailing edge of the paper when the recording is performed on the first surface becomes a leading edge thereof due to a backward feeding operation of the transportation rollers **64** and the discharge rollers **74**, the paper **P** is fed to an inverted path **78** to be described later, which is positioned on a side further in a **-Z** direction than the second roller **52** in the **Z** axis direction, that is, which is positioned below the transportation unit **66**. The inverted path **78** is provided below the first roller **50** and the second roller **52**, that is, along the **-Z** direction in FIG. **3** and is provided to converge with the transportation path of the paper **P** from the medium container **20**.

For this reason, the paper **P** is fed to the recording section **28** again via the transportation path from the inverted path **78** and a transportation path that is positioned above the first roller **50** and the second roller **52**, and the recording section **28** performs recording on a second surface. After the recording is completed, the paper **P** is nipped by the discharge rollers **74**, and is discharged to the discharge stacker **76** that is provided on the front side of the apparatus.

First Embodiment

Subsequently, the transportation section **26** will be described with reference to FIGS. **3** and **5**. In FIG. **5**, a solid line indicates the transportation path of the medium fed from the medium container **20**, and a broken line indicates the inverted path of the paper **P**. The first roller **50** and the second roller **52** are provided at the same position in the **Z** axis direction of FIG. **3**. For this reason, it is possible to limit dimensions of disposition regions of the first roller **50** and the second roller **52** to the minimum in the **Z** axis direction.

The first roller **50** and the second roller **52** are disposed with a gap in the **Y** axis direction therebetween. That is, in the transportation path of the paper **P**, the first roller **50** is positioned on an upstream side of the transportation path, and the second roller **52** is positioned on the downstream side of the transportation path. The gap is set to have a length less than the minimum length in a transportation path direction of the paper **P** corresponding to the printer **10**.

Furthermore, in the front and back direction of the apparatus (in the **Y** axis direction in FIGS. **3** and **5**) with respect to the recording head **70** to be described later of the recording section **28**, the first roller **50** and the second roller **52** are positioned on a back side (in the **+Y** direction) with respect to the disposition region of the recording head **70**, and are provided at the same position as a position of the disposition region of the recording head **70** in the height direction of the apparatus (in the **Z** axis direction). For this reason, it is possible to prevent the disposition region of the recording head **70** from overlapping the disposition regions of the first roller **50** and the second roller **52** in the height direction (in the **Z** axis direction) of the apparatus, and it is possible to suppress increase of the dimension in the height direction (in the **Z** axis direction) of the apparatus.

As illustrated in FIG. **5**, the first roller **50** inverts the paper **P** fed from a side of the recording head **70** by using an outer circumferential surface thereof and thus, the first surface is on the bottom, and the second surface is on the top. Furthermore, an outer circumferential surface of the second roller **52** is in contact with the transportation path before the paper **P** is inverted by the first roller **50**, that is, the inverted path **78**, and is in contact with the transportation path after the paper **P** is inverted by the first roller **50**, that is, the transportation path

above the first and the second rollers 50 and 52 and thus, the second roller 52 exerts a transportation force on the paper P.

In FIG. 3, the first transportation driven roller 54 is positioned above a center shaft of the second roller 52 and on the front side of the apparatus, that is, on the side of the -Y direction, and is in contact with the second roller 52. That is, while the paper P is nipped between the second roller 52 and the first transportation driven roller 54, the first transportation driven roller 54 is rotationally driven to transport the paper P. The second transportation driven roller 56 is positioned on an upstream side in the transportation path of the first transportation driven roller 54, and on the side further in the +Z direction than the second roller 52 in the Z axis direction in FIG. 3. The second transportation driven roller 56 is in contact with the second roller 52. That is, while the paper P is nipped between the second roller 52 and the second transportation driven roller 56, the second transportation driven roller 56 is rotationally driven to transport the paper P to the first transportation driven roller 54.

For this reason, when the second roller 52 transports the paper P along the transportation path, the first transportation driven roller 54 and the second transportation driven roller 56 transports the paper P while the paper P is nipped thereby and thus, it is possible to reliably suppress oblique feeding of the paper P during the transportation.

The third transportation driven roller 58 is positioned on the upstream side in the transportation path of the second transportation driven roller 56, and the third transportation driven roller 58 is positioned on the side further in the +Z direction than the first roller 50 in the Z axis direction in FIG. 3, and is in contact with the first roller 50. That is, while the paper P is nipped between the first roller 50 and the third transportation driven roller 58, the third transportation driven roller 58 is rotationally driven to transport the paper P toward the second roller 52.

The pair of transportation rollers 64 is provided on a downstream side of the transportation path from a nipping position between the second roller 52 and the first transportation driven roller 54. While the paper P is nipped between the first roller 50 and the third transportation driven roller 58, and then between the second roller 52 and the second transportation driven roller 56, and then between the second roller 52 and the first transportation driven roller 54, that is, while the paper P is nipped in the sequence listed along the transportation path, the paper P is transported to the transportation rollers 64.

For this reason, when the paper P is transported by the first roller 50 and the second roller 52 along the transportation path, the paper P is transported while being nipped by the third transportation driven roller 58, and then by the second transportation driven roller 56 and then by the first transportation driven roller 54 in the sequence listed and thus, it is possible to reliably suppress oblique feeding of the paper P during the transportation.

In the transportation path, the length of the path from the nipping position between the second roller 52 and the first transportation driven roller 54 to a nipping position between the pair of transportation rollers 64 is set to be less than the minimum length in the transportation path direction of the paper P corresponding to the printer 10.

In the inverted path illustrated by the broken line in FIG. 5, the length of the inverted path is set to be larger than the maximum length in the transportation path direction of the paper P corresponding to the printer 10, in such a manner that leading edge and trailing edge sides in the transportation direction of the paper P do not overlap the lead edge and the trailing edge sides in an inverted transportation path thereof.

For this reason, it is possible to prevent the diameter of the first roller 50 from becoming large, and to ensure that the inverted path 78 has sufficient length for the second roller 52 to invert the paper P. Since the second roller 52 can exert a transportation force on the inverted path before the paper P is inverted and on the transportation path after the paper P is inverted, it is possible to reduce the number of the rollers that are disposed, and to suppress an increase in cost.

The fourth transportation driven roller 60 is positioned on the side further in the -Z direction than the second roller 52 in the Z axis direction in FIG. 3, and is in contact with the second roller 52. Furthermore, the fifth transportation driven roller 62 is positioned on an upper stream side in the transportation path of the third transportation driven roller 58, and is provided on the feeding path section 48 of the back surface cover 22 forming a part of the transportation path from the medium container 20 to be in contact with the first roller 50. That is, while the paper P is nipped between the first roller 50 and the fifth transportation driven roller 62, the fifth transportation driven roller 62 is rotationally driven to transport the paper P toward the third transportation driven roller 58. When the back surface cover 22 to be described later is open with respect to the apparatus main body 12, the fifth transportation driven roller 62 separates from the first roller 50.

Herein, the transportation path of the paper P will be described again. The paper P fed from the upper stage tray 32 and the lower stage tray 34 is guided to the feeding path section 48 of the back surface cover 22, and is nipped by the first roller 50 and the fifth transportation driven roller 62. The paper P is fed along the outer circumferential surface of the first roller 50, and is nipped by the first roller 50 and the third transportation driven roller 58. The paper P is fed to the downstream side of the transportation path.

That is, the feeding path of the paper P fed from the medium container 20 (the upper stage tray 32 and the lower stage tray 34) converges with the transportation path formed by the first roller 50. For this reason, the first roller 50 forms not only the inverted path but also the non-inverted path. Accordingly, it is possible to achieve space saving and to reduce the number of components.

The paper P supported by the medium support tray 24 is drawn into the transportation path from a section between the fifth transportation driven roller 62 and the third transportation driven roller 58 in the transportation path via the medium support tray 24 and the feeding path section 80, and the leading edge of the paper P is nipped by the first roller 50 and the third transportation driven roller 58. The paper P fed from the medium support tray 24 converges with the transportation path of the paper P transported from the medium container 20 and is fed to the downstream side of the transportation path.

That is, a supply path of the paper P supplied from the medium support tray 24 converges with the transportation path formed by the first roller 50. For this reason, the first roller 50 can form the supply path of the medium from the medium support tray 24. Accordingly, it is possible to achieve space saving and to reduce the number of components.

As illustrated in FIG. 5, since the second roller 52 is positioned downstream of the first roller 50, it is possible to ensure the length (the length of the path of up to the recording section 28) of the supply path of the paper P supplied via the medium support tray 24. Accordingly, when a user manually supplies the paper P via the medium support tray 24, there is a problem in that the user inserts the paper P into the apparatus deep enough to significantly exceeding a recommended setting position. At this time, if the leading edge of the paper P reaches a position that faces the recording head 70, the recording head 70 cannot properly perform recording on the

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paper P. However, since it is possible to ensure the length of the supply path of the paper P supplied via the medium support tray 24, it is possible to prevent the problem from occurring.

Subsequently, the paper P is nipped by the second roller 52 and the second transportation driven roller 56. The paper P is fed to the downstream side of the transportation path, and is nipped by the second roller 52 and the first transportation driven roller 54. Thereafter, the paper P is further transported to the pair of transportation rollers 64. The paper P is nipped by the transportation rollers 64, and is fed to the recording section 28 on the downstream side of the transportation path, and recording is performed on the first surface of the paper P. After the recording is completed, the paper P is nipped by the discharge rollers 74, and is discharged to the discharge stacker 76 that is provided on the front side of the apparatus.

When the recording section 28 performs recording on both surfaces of the paper P in the printer 10, the recording section 28 performs the recording on the first surface of the paper P, and then while the trailing edge of the paper when the recording is performed on the first surface becomes the leading edge thereof due to a backward feeding operation of the transportation rollers 64 and the discharge rollers 74, the paper P is fed to the inverted path 78 which is positioned on the side further in the -Z direction than the second roller 52 in the Z axis direction.

The paper P fed to the inverted path 78 is nipped by the second roller 52 and the fourth transportation driven roller 60, and is fed to the outer circumferential surface on the side further in the -Z direction than the first roller 50. Along the outer circumferential surface of the first roller 50, the paper P is nipped again by the first roller 50 and the fifth transportation driven roller 62. Accordingly, the paper P is bent and inverted so that the first surface is on the bottom and the second surface is on the top. Thereafter, the paper P is fed along the transportation path to the recording section 28 by the transportation rollers 64 via the first roller 50, the third transportation driven roller 58, the second transportation driven roller 56, the first transportation driven roller 54 and the second roller 52.

For this reason, the second surface faces the recording head 70. The recording section 28 performs recording on the second surface, and the paper P is nipped by the discharge rollers 74 and is discharged to the discharge stacker 76 that is provided on the front side of the apparatus.

Subsequently, the transportation unit 66 will be described with reference to FIGS. 6, 7A and 7B. The transportation unit 66 is configured to be attachable and detachable with respect to the apparatus main body 12. A method for attaching and detaching the transportation unit 66 with respect to the apparatus main body 12 will be described later.

The transportation unit 66 includes a unit main body 82 and a cover section 84. In the embodiment, a driven transmission unit 86 is provided in an end portion on the side further in the +X direction than the unit main body 82. The driven transmission unit 86 includes a first transmission gear 88, a second roller drive gear 90, a second transmission gear 92 and a first roller drive gear 94. The first transmission gear 88 engages with the second roller drive gear 90, and the second roller drive gear 90 engages with the second transmission gear 92, and the second transmission gear 92 engages with the first roller drive gear 94.

The second roller drive gear 90 is connected to the second roller 52 via a shaft that is not illustrated. The first roller drive gear 94 is connected to the first roller 50 via a shaft that is not illustrated.

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In a state where the transportation unit 66 is attached to the apparatus main body 12, the driven transmission unit 86 of the transportation unit 66 is connected to a drive transmission unit 96 to be described later on a side of the apparatus main body 12, and receives a drive force from the drive transmission unit 96. That is, the driven transmission unit 86 drives the first roller 50 and the second roller 52 by using the drive force of the drive transmission unit 96 on the side of the apparatus main body 12. Accordingly, it is not necessary to provide a driving source in the transportation unit 66, and it is possible to prevent the weight of the transportation unit 66 from increasing.

In the embodiment, the first roller 50 and the second roller 52 are disposed in a center portion in a width direction (in an X axis direction in FIG. 7A) of the unit main body 82. The first roller 50 is disposed on a back end side (on a side of a +Y direction in FIG. 7A) of the unit main body 82. The second roller 52 is disposed with a gap on the side of the -Y direction from the first roller 50.

In the embodiment, the first roller 50 and the second roller 52 are set to have a diameter of the same dimension. For this reason, the first roller 50 and the second roller 52 can be made of a common configuration member, and it is possible to achieve low costs. Since the first roller 50 and the second roller 52 have the same diameter, it is possible to easily set circumferential velocities of the outer circumferences of the rollers, that is, paper transportation velocities, to be equal to each other by setting the numbers of rotations of both rollers to be the same. Since the first roller 50 and the second roller 52 have a diameter of the same dimension, it is possible to horizontally maintain the paper P that is transported in the transportation path which is formed between the unit main body 82 and the cover section 84 to be described later.

Since the first roller 50 and the second roller 52 can have the same paper transportation velocity, tension or deflection is not exerted on the paper P between the first roller 50 and the second roller 52. As a result, it is possible to reliably transport the paper P along the transportation path.

The first roller 50 and the second roller 52 are driven by a drive force from the first transmission gear 88. For this reason, the first roller 50 and the second roller 52 can have a common driving source. For this reason, since it is not necessary to provide the driving source for each of the first roller 50 and the second roller 52, it is possible to prevent costs from increasing.

Since the transportation unit 66 that is attachable and detachable with respect to the apparatus main body 12 is configured to have the first roller 50 and the second roller 52, when the transportation unit 66 is detached from the apparatus main body 12, the inverted path 78 provided in the apparatus main body 12 is exposed. Accordingly, it is possible to easily remove the jammed paper P when the paper P is jammed (when a paper jam occurs).

As illustrated in FIGS. 6 and 7A, the cover section 84 has a configuration in which the cover section 84 is attached to a rotationally moving shaft that is provided on the side further in the -Y direction than the unit main body 82, and can be opened and closed when the cover section 84 rotationally moves with respect to the unit main body 82. Specifically, as illustrated in FIG. 6, the cover section 84 can be closed with respect to the unit main body 82. As illustrated in FIG. 7A, the cover section 84 can be opened with the unit main body 82. As illustrated in FIG. 7A, the first transportation driven roller 54, the second transportation driven roller 56 and the third transportation driven roller 58 are rotatably provided on an inner surface 84a of the cover section 84.

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When the cover section **84** is closed with respect to the unit main body **82**, the first transportation driven roller **54**, the second transportation driven roller **56** and the third transportation driven roller **58** are disposed on the inner surface **84a** to be in contact with the first roller **50** and the second roller **52** at the positions illustrated in FIG. 5.

That is, when the cover section **84** is closed with respect to the unit main body **82**, the first transportation driven roller **54** and the second transportation driven roller **56**, and the third transportation driven roller **58** are respectively in contact with the second roller **52** and the first roller **50**. When the cover section **84** is open with respect to the unit main body **82**, the first transportation driven roller **54** and the second transportation driven roller **56**, and the third transportation driven roller **58** respectively separate from the second roller **52** and the first roller **50**.

For this reason, when the cover section **84** is open, it is possible to easily remove the paper P, for example, a small piece of the paper P, jammed inside the transportation unit **66**.

The unit main body **82** includes an upper surface **82a** and a lower surface **82b**. When the cover section **84** is closed with respect to the unit main body **82**, with a predetermined gap between the upper surface **82a** and the inner surface **84a**, the upper surface **82a** faces the inner surface **84a** of the cover section **84**. That is, when the cover section **84** is closed with respect to the unit main body **82**, the upper surface **82a** and the inner surface **84a** form a part of the transportation path of the paper P. When the transportation unit **66** is attached to the apparatus main body **12**, the inverted path **78** (refer to FIGS. 3 and 5) is formed between the lower surface **82b** and a support plate **98** (refer to FIGS. 3 and 5) of the apparatus main body **12**.

The first roller **50** and the second roller **52** protrude to the transportation path and the inverted path **78** from the upper surface **82a** and the lower surface **82b** of the unit main body **82**. Even when the cover section **84** is closed, the back end side (on the side of the Y direction in FIG. 6) of the unit main body **82** is open and is exposed.

When the transportation unit **66** is mounted onto the apparatus main body **12**, and the back surface cover **22** is closed with respect to the apparatus main body **12**, the back end side (on the side of the Y direction in FIG. 6) of the unit main body **82** faces the feeding path section **48** of the back surface cover **22**. Accordingly, the back end side of the unit main body **82** and the feeding path section **48** form a part of the transportation path from the medium container **20** and a part of the inverted path **78**.

The first roller **50** protrudes from the back end side of the unit main body **82** to the transportation path that is formed by the back end portion and the feeding path section **48**. For this reason, the outer circumferential surface of the first roller **50** protrudes to the transportation path and the inverted path from the upper surface **82a**, the back end side and the lower surface **82b** of the unit main body **82**, and rotation of the first roller **50** can be used to transport the paper P.

In both end portions in a width direction (in an X axis direction in FIG. 6) of the back end side (the side of the +Y direction in FIG. 6) of the unit main body **82**, grasping sections **100** are provided to protrude to the side of the +Y direction. For this reason, when the transportation unit **66** is attached and detached with respect to the apparatus main body **12**, good workability is obtained.

In each end portion in the width direction (in an X axis direction in FIG. 7B) of the unit main body **82**, a protrusion **102** (refer to FIGS. 6 and 7B) is provided on the lower surface **82b** of the unit main body **82** to protrude in a -Z direction in FIG. 7B from the lower surface **82b**. In each end portion in the

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width direction (in the X axis direction in FIG. 6) of the back end side (the side of the +Y direction in FIG. 6) of the unit main body **82**, a pressed section **104** is provided. The protrusion **102** and the pressed section **104** will be described in detail later.

Subsequently, the back surface cover **22** and a mounting section **106** (refer to FIG. 10A) of the transportation unit **66** of the apparatus main body **12** will be described with reference to FIGS. 8, 9A, 9B, 10A and 10B. In FIG. 8, the back surface cover **22** is open with respect to the apparatus main body **12**. At this time, the transportation unit **66** is mounted onto the apparatus main body **12**. For this reason, when the back surface cover **22** and the medium support tray **24** provided on the back surface cover **22** are open with respect to the apparatus main body **12**, at least parts of the back end side (the side of the +Y direction in FIG. 6) of the transportation unit **66** and the first roller **50** are exposed to the outside of the apparatus main body **12**.

Accordingly, a part of the transportation path from the medium container **20** and a part of the supply path from the medium support tray **24** are exposed to the outside of the apparatus main body **12**. In addition, at least a part of the first roller **50** is exposed, thereby causing the paper P jammed in the transportation path and the supply path to be exposed. Accordingly, it is possible to easily remove the paper P and to easily perform a paper jam release operation.

When the back surface cover **22** is open with respect to the apparatus main body **12**, the first roller **50** of the transportation unit **66** separates from the fifth transportation driven roller **62** that is provided on the inside of the back surface cover **22**. For this reason, when the paper P fed from the medium container **20** is jammed in the transportation path from the medium container **20**, it is possible to easily remove the paper P.

In FIGS. 9A and 9B, the feeding path section **48** is provided on the inside of the back surface cover **22** to form a part of the transportation path. A pressing section **108** is provided in each end portion in an X axis direction in FIG. 9A of the back surface cover **22**. When the back surface cover **22** is closed with respect to the apparatus main body **12**, the pressing sections **108** are provided on the back surface cover **22** at positions where the pressing sections **108** engage with the pressed sections **104** of the transportation unit **66**.

Accordingly, when the transportation unit **66** is mounted onto the apparatus main body **12** and the back surface cover **22** is closed with respect to the apparatus main body **12**, the transportation unit **66** is mounted onto the apparatus main body **12**, the pressed section **104** and the pressing section **108** engage each other. That is, in a state where the back surface cover **22** is closed with respect to the apparatus main body **12**, the back surface cover **22** is in contact with the transportation unit **66** and thus, a closed posture of the back surface cover **22** is regulated.

For this reason, a relative position relationship between the back surface cover **22** and the transportation unit **66** is accurately determined. Accordingly, when the transportation path of the paper P is formed by the back surface cover and the transportation unit **66**, the feeding path section **48** of the back surface cover **22** faces the back end side of the transportation unit **66** while a proper gap is maintained between the feeding path section **48** and the back end side. As a result, it is possible to properly form the transportation path of the paper P.

Subsequently, FIG. 10A illustrates a state where the transportation unit **66** is detached from the apparatus main body **12**. When the back surface cover **22** is open, the apparatus main body **12** is provided with the mounting section **106** that is exposed toward the back surface side (a side of a +Y

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direction in FIG. 10A) of the apparatus. It is possible to mount the transportation unit 66 on the mounting section 106 by inserting the transportation unit 66 from the back surface side of the apparatus, that is, from the side of the +Y direction to a side of a -Y direction.

That is, since the transportation unit 66 is mounted onto the mounting section 106 that is exposed when the openable and closeable back surface cover 22 provided on the apparatus main body 12 is open, it is possible to prevent a user from unintentionally dropping the transportation unit 66. Since the transportation unit 66 is not configured to have a member forming an exterior of the apparatus main body as an element, that is, the back surface cover 22 and the transportation unit 66 are separately configured, it is possible to reduce the weight of the transportation unit 66, and to obtain good workability when attaching and detaching the transportation unit 66 with respect to the apparatus main body 12. Even in a case where the size of the printer 10 becomes large, it is possible to prevent the weight of the transportation unit 66 from increasing, and to ensure good handleability.

FIG. 10B illustrates an end portion on a side of a +X direction in a width direction (in an X axis direction in FIGS. 10A and 10B) of the mounting section 106. On the support plate 98 forming the inverted path 78 of the apparatus main body 12, a sloping surface 110 is provided in the end portion on the side of the +X direction in the width direction. The sloping surface 110 is provided in the end portion on the side further in the -X direction than the support plate 98 (not illustrated), and the sloping surface 110 engages with the protrusion 102 of the transportation unit 66 at a second position (refer to FIG. 13A) to be described to configure a retention unit 112 that retains the transportation unit 66 at the second position.

Subsequently, the following will be described with reference to FIGS. 11A, 11B, 12A, 12B, 13A and 13B: a method for attaching and detaching the transportation unit 66 with respect to the apparatus main body 12 and a connection and disconnection of power transmission means.

In FIGS. 11A and 11B, the drive transmission unit 96 of the apparatus main body 12 is connected to the driven transmission unit 86 of the transportation unit 66. In a state where the drive transmission unit 96 and the driven transmission unit 86 are connected to each other, in the front and back direction (in a Y axis direction in FIG. 11A) of the apparatus, a position of the transportation unit 66 with respect to the apparatus main body 12 is referred to as a first position Y1 (refer to FIG. 11B).

Herein, the drive transmission unit 96 is configured to have a gear train that is configured to have a plurality of gears. A drive gear 114 is positioned at one end of the row of gear train, and is connected to the drive motor 116. A third transmission gear 118 is positioned at the other end thereof, and engages with the first transmission gear 88 of the driven transmission unit 86. Herein, the drive transmission unit 96 is configured in such a manner that the third transmission gear 118 always rotates in a counter-clockwise direction no matter which direction the drive motor 116 rotates in.

For this reason, when the drive transmission unit 96 and the driven transmission unit 86 are connected to each other at the first position Y1, due to a rotational drive force of the drive motor 116, the first roller drive gear 94 and the second roller drive gear 90, that is, the first roller 50 and the second roller 52, are rotationally driven in a counter-clockwise direction, that is, in a direction in which the paper P is fed along the transportation path.

Subsequently, a second position Y2 will be described with reference to FIGS. 12A, 12B and 13A. In the front and back direction (in a Y axis direction in FIGS. 12B and 13A) of the

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apparatus, the second position Y2 (refer to FIGS. 12B and 13A) indicates a position of which the driven transmission unit 86 separates from the drive transmission unit 96, that is, the transportation unit 66 pulls out with respect to the first position Y1.

In FIG. 12A, when the back surface cover 22 is open with respect to the apparatus main body 12, the engagement between the pressed section 104 of the transportation unit 66 and the pressing section 108 is released. For this reason, the regulation in the Y axis direction of the transportation unit 66 is released with respect to the apparatus main body 12. Accordingly, the transportation unit 66 can be displaced to a side of a +Y direction with respect to the apparatus main body 12.

Herein, when a user grasps the grasping section 100 to slide the transportation unit 66 in the +Y direction, as illustrated in FIG. 12B, the transportation unit 66 moves from the first position Y1 to the second position Y2 in the Y axis direction. Accordingly, the engagement between the third transmission gear 118 of the drive transmission unit 96 and the first transmission gear 88 of the driven transmission unit 86 is released. That is, the driven transmission unit 86 separates from the drive transmission unit 96, and the drive force of the drive motor 116 is not transmitted to the driven transmission unit 86.

For this reason, the first transmission gear 88, the second roller drive gear 90, the second transmission gear 92 and the first roller drive gear 94 of the driven transmission unit 86 are freely rotatable. Accordingly, the first roller 50 and the second roller 52 rotated by the driven transmission unit 86 are freely rotatable.

At this time, if the transportation unit 66 slides from the first position Y1 to the second position Y2, the protrusion 102 of the transportation unit 66 engages with the sloping surface 110 that is provided on the support plate 98. Accordingly, when a pullout force equal to or smaller than a predetermined magnitude is exerted on the transportation unit 66, the transportation unit 66 is retained at the second position Y2 in the Y axis direction by the retention unit 112 that is configured to have the protrusion 102 and the sloping surface 110.

Accordingly, in a state where the transportation unit 66 is mounted onto the apparatus main body 12, the transportation unit 66 is configured to be displaceable between the first position Y1 at which the driven transmission unit 86 is connected to the drive transmission unit 96 and the second position Y2 of which the driven transmission unit 86 separates from the drive transmission unit 96, that is, the transportation unit 66 pulls out with respect to the first position Y1.

Furthermore, when a pullout force equal to or larger than a predetermined magnitude is exerted on the transportation unit 66, the protrusion 102 climbs over the sloping surface 110 along a +Z direction in FIG. 13A and thus, the retention unit 112 can release the retention of the transportation unit 66 at the second position Y2. For this reason, as illustrated in FIG. 13B, the transportation unit 66 moves from the mounting section 106 of the apparatus main body 12 to the outside of the apparatus main body 12, and is detached from the apparatus main body 12.

That is, if a pullout force equal to or larger than a predetermined magnitude is applied to the transportation unit 66, it is possible to pull out the transportation unit 66 from the mounting section 106. Accordingly, when the transportation unit 66 is pulled out good workability is obtained compared to a configuration in which the transportation unit 66 is completely locked at the second position Y2.

When the transportation unit 66 is mounted onto the apparatus main body 12, the transportation unit 66 is inserted onto

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the mounting section 106 in the +Y direction in FIG. 13B. In a state where the transportation unit 66 is positioned at the second position Y2 with respect to the apparatus main body 12, the back surface cover 22 is closed with respect to the apparatus main body 12. Accordingly, the pressing section 108 (refer to FIG. 9A) of the back surface cover 22 engages with the pressed section 104 (refer to FIG. 8) of the transportation unit 66, and the pressed section 104 is pressed in a -Y direction, and the transportation unit 66 is pressed into the first position Y1. Accordingly, the driven transmission unit 86 is connected to the drive transmission unit 96, and a drive force from the drive motor 116 is transmitted to the driven transmission unit 86.

Subsequently, when the paper P is jammed in the transportation path formed by the transportation unit 66, a paper jam release process will be described with reference to FIGS. 11A, 11B, 12A, 12B, 13A and 13B again.

In FIG. 11A, when the paper P is jammed in the transportation path, first, the back surface cover 22 is open with respect to the apparatus main body 12. Accordingly, the transportation path from the medium container 20 to the transportation unit 66 is exposed and thus, it is possible to confirm the paper P that causes a paper jam. Accordingly, it is possible to easily remove the paper P that causes a paper jam in the transportation path from the medium container 20 to the transportation unit 66.

Subsequently, when a paper jam occurs in a state where the paper P is nipped by the first roller 50, the second roller 52, the first transportation driven roller 54, the second transportation driven roller 56 and the third transportation driven roller 58, if the back surface cover is open with respect to the apparatus main body 12, a part of the paper P jammed on an outside, that is, the back end side of the transportation unit 66 is exposed. At this time, since the jammed paper P is nipped by each of the rollers, a force of pulling out the paper P is larger than a force of retaining the transportation unit 66 at the first position Y1. For this reason, when a user pulls out the paper P that is exposed to the outside from the back end side of the transportation unit 66, it is possible to move the transportation unit 66 from the first position Y1 to the second position Y2.

For this reason, when the transportation unit 66 is positioned at the second position Y2, a drive force is not transmitted to the transportation unit 66. That is, since the first roller 50 and the second roller 52 of the transportation unit 66 are freely rotatable, it is possible to easily pull out the paper P in contact with the first roller 50 and the second roller 52, and to easily perform a paper jam release operation.

Furthermore, even in a case where the paper P is nipped at multiple positions, when only a connection between the drive transmission unit 96 and the driven transmission unit 86 is released, a drive force is not transmitted to the entirety of the transportation unit 66, that is, each of the rollers are freely rotatable at the multiple nipping positions (a position between the first roller 50 and the third transportation driven roller 58, a position between the second roller 52 and the second transportation driven roller 56, and a position between the second roller 52 and the first transportation driven roller 54) of the paper P. In a configuration in which the paper P is nipped at multiple positions, it is possible to avoid complexity of the structure and to easily remove the paper P.

When a user pulls out the paper P of which a part is nipped by the first roller 50, the second roller 52, the first transportation driven roller 54, the second transportation driven roller 56 and the third transportation driven roller 58, and appears on the outside of the transportation unit 66, that is, on the back end side thereof, the transportation unit 66 moves to the second position Y2 and thus, it is not necessary for the user to

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move the transportation unit 66 from the first position Y1 to the second position Y2, and good workability is obtained.

Since the printer 10 includes the retention unit 112, that is, the protrusion 102 and the sloping surface 110, which retains the transportation unit 66 at the second position Y2, when the transportation unit 66 moves from the first position Y1 to the second position Y2, the retention unit 112 can prevent the transportation unit 66 from unintentionally returning to the first position Y1 during a paper jam release operation of the paper P.

Since the printer 10 includes the retention unit 112 that retains the transportation unit 66 at the second position Y2, when a user pulls out the paper P that is nipped by the first roller 50, the second roller 52, the first transportation driven roller 54, the second transportation driven roller 56 and the third transportation driven roller 58 in a state where the transportation unit 66 is retained at the second position Y2, the retention of transportation unit 66 at the second position Y2 is maintained, and the paper P is pulled out from between the first roller 50 and the third transportation driven roller 58, between the second roller 52 and the second transportation driven roller 56, and between the second roller 52 and the first transportation driven roller 54.

That is, since a force of retaining the transportation unit 66 at the second position Y2 is larger than a force of pulling out the paper P from the transportation unit 66, that is, since the retention unit 112 retains the transportation unit 66 at the second position against the operation of pulling out the paper P, when the paper P is pulled out from the transportation unit 66, it is possible to avoid such a problem that the transportation unit 66 is accompanied by the paper P and thus, is also pulled out from the apparatus main body 12.

Modification Example of First Embodiment

(1) In the configuration of the embodiment, one each of the first roller 50 and the second roller 52 are provided at the center in a direction that intersects with the transportation direction of the paper P, that is, in the width direction of the unit main body 82 of the transportation unit 66. However, the embodiment may have a configuration in which at least any one of the first roller 50 and the second roller 52 is provided at multiple positions along the direction that intersects with the transportation direction of the paper P, that is, along the width direction of the unit main body 82. In particular, in a configuration in which the plurality of second rollers 52 are provided in the width direction, since the paper P is in contact with the second roller 52 at multiple positions in the width direction of the paper P and thus, it is possible to suppress oblique feeding of the paper P during the transportation thereof.

(2) In a configuration in which at least any one of the first roller 50 and the second roller 52 is provided at multiple positions along the direction that intersects with the transportation direction of the paper P, that is, along the width direction of the unit main body 82, a plurality of the first transportation driven rollers 54 and the second transportation driven rollers 56, and a plurality of the third transportation driven rollers 58 may be provided to be respectively in contact with the second rollers 52 and the first rollers 50. With this configuration, it is possible to further prevent the oblique feeding of the paper P during the transportation thereof.

(3) In the configuration of the embodiment, the protrusion 102 of the retention unit 112 is provided on a side of the transportation unit 66, and the sloping surface 110 of the retention unit 112 is provided on a side of the apparatus main body 12. However, the embodiment may have a configuration

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in which the protrusion **102** is provided on the side of the apparatus main body **12**, and the sloping surface **110** is provided on the side of the transportation unit **66**.

(4) In the configuration of the embodiment, the first roller **50** and the second roller **52** transport the paper **P** by using the outer circumferential surfaces thereof. However, the embodiment may have a configuration in which an endless belt is wound around between the first roller **50** and the second roller **52**, and the endless belt driven by rotation of the first roller **50** and the second roller **52** transports the paper **P**.

Second Embodiment

FIGS. **14** and **15** illustrate a printer **120** according to a second embodiment of the invention. The printer **120** is different from that of the first embodiment in that the first transportation driven roller **54**, the second transportation driven roller **56** and the third transportation driven roller **58** are not provided on a transportation unit **122** but on a apparatus main body **124**.

As illustrated in FIGS. **14** and **15**, the printer **120** is configured in such a manner that the transportation unit **122** is attachable and detachable with respect to the apparatus main body **124**. The back surface cover **22** is open and closed, and the transportation unit **122** is attached and detached with respect to the apparatus main body **124**. Similarly to in the first embodiment, the transportation unit **122** is provided with the first roller **50** and the second roller **52**. Similarly to in the first embodiment, when the transportation unit **122** is mounted onto the apparatus main body **124**, and the drive transmission unit **96** of the apparatus main body **124** is connected to the driven transmission unit **86** of the transportation unit **122**, the first roller **50** and the second roller **52** are rotationally driven by a drive force supplied from the apparatus main body **124**.

When the transportation unit **122** is mounted onto the apparatus main body **124**, the apparatus main body **124** is provided with the first transportation driven roller **54**, the second transportation driven roller **56** and the third transportation driven roller **58** in such a manner that the first transportation driven roller **54** and the second transportation driven roller **56**, and the third transportation driven roller **58** are respectively in contact with the second roller **52** and the first roller **50**.

The pressed section **104** (refer to FIGS. **6** and **8**) is provided on a back end side of the transportation unit **122**. In contrast, the pressing section **108** (refer to FIGS. **9A** and **9B**) is provided on a side of the inner surface of the back surface cover **22**, that is, on a side of the back surface cover **22**, which faces the apparatus main body **124**.

In the embodiment, when the transportation unit **122** is mounted onto the apparatus main body **124**, and the back surface cover **22** is closed, the pressed section **104** and the pressing section **108** are in contact with each other, and the pressing section **108** presses the pressed section **104**. Accordingly, the transportation unit **122** moves from the second position **Y2** to a front side (a side of a $-Y$ direction in FIGS. **14** and **15**) of the apparatus with respect to the apparatus main body **124**, and the transportation unit **122** is positioned at the first position **Y1**. Accordingly, the drive transmission unit **96** is connected to the driven transmission unit **86**, and the paper **P** can be transported.

When the transportation unit **122** is mounted onto the apparatus main body **124**, and the back surface cover **22** is open with respect to the apparatus main body **124**, the engagement between the pressed section **104** and the pressing section **108** is released. When the pressed section **104** and the pressing section **108** disengage each other, the apparatus main body

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124 is provided with bias means which is not illustrated and biases the transportation unit **122** in a $+Y$ direction in FIG. **15**. Accordingly, in the embodiment, when the back surface cover **22** is open with respect to the apparatus main body **124**, the transportation unit **122** is displaced from the first position **Y1** to the second position **Y2** by the bias means which is not illustrated.

That is, in the embodiment, when the back surface cover **22** is closed, the transportation unit **122** is retained at the first position **Y1** by the back surface cover **22**. When the closed back surface cover **22** is open, the transportation unit **122** is displaced from the first position **Y1** to the second position.

Accordingly, since the transportation unit **122** is displaced from the first position **Y1** to the second position **Y2**, it is not necessary for a user to move the transportation unit **122** itself from the first position **Y1** to the second position **Y2**, and good workability is obtained.

In addition, in each of the embodiments described above, the transportation units **66** and **122** are applied to an ink jet printer as an example of the recording apparatus. However, the transportation units **66** and **122** are also typically applicable to other liquid ejecting apparatuses.

Herein, the liquid ejecting apparatus is not limited to a printer, a copying machine, a facsimile and the like that uses an ink jet type recording head, and performs recording on a recording medium by discharging ink from the recording head. The liquid ejecting apparatus includes a apparatus that ejects liquid suitable for the purpose instead of ink on an ejected medium equivalent to the recorded medium from a liquid ejecting head equivalent to the ink jet type recording head, and adheres the liquid on the ejected medium.

In addition to the recording head describe above, there are following liquid ejecting heads: a color material ejecting head used in manufacturing a color filter such as a liquid crystal display; an electrode material (electric conductive paste) ejecting head used in forming an electrode of an organic EL display, a field emission display (FED) or the like; a living organic matter ejecting head used in manufacturing a biochip; a specimen ejecting head as a precision pipette; and the like.

The invention is not limited to the embodiments described above. The invention can be modified in various forms insofar as the modifications do not depart from the scope of the invention, which is described in the claims. The scope of the invention includes the modifications.

The entire disclosure of Japanese Patent Application No. 2013-072352, filed Mar. 29, 2013 is expressly incorporated by reference herein.

What is claimed is:

1. A recording apparatus comprising:

- a apparatus main body that includes a recording head which performs recording on a medium; and
- a unit body that forms a medium transportation path through which the medium is transported, and is configured to be attachable and detachable with respect to the apparatus main body, wherein the unit body includes
 - a feeding roller that transports the medium,
 - a driven roller that nips the medium between the feeding roller and the driven roller, and
 - a driven transportation unit that is connected to a drive transportation unit which is provided on a side of the apparatus main body to transmit a drive force, and that transmits the drive force of the drive transportation unit to the feeding roller,
- wherein, in a state where the unit body is mounted on the apparatus main body, the unit body is displaceable between a first position at which the driven transmission

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unit is connected to the drive transmission unit and a second position at which the driven transmission unit is separated from the drive transmission unit, that is, the unit body is pulled out with respect to the first position, and

wherein a user pulls on a part of the medium which appears outside of the unit body with the medium nipped by the feeding roller and the driven roller to cause the unit body retained at the first position to move from the first position to the second position.

2. The recording apparatus according to claim 1, further comprising:

a retention unit that retains the unit body at the second position against an operation of pulling out the medium.

3. The recording apparatus according to claim 2, wherein when a user pulls out the medium that is nipped by the feeding roller and the driven roller in a state where the unit body is retained at the second position, the retention of the unit body at the second position is maintained, and the medium is pulled out from between the feeding roller and the driven roller.

4. The recording apparatus according to claim 2, wherein the retention unit is configured to include a protrusion that is provided on one of the apparatus main body and the unit body; and a sloping surface that is provided on the other of the apparatus main body and the unit body, which is not provided with the protrusion, to engage with the protrusion, and

wherein when a pullout force equal to or larger than a predetermined magnitude is exerted on the unit body, the protrusion climbs over the sloping surface and thus, the retention of the unit body is released from the second position.

5. The recording apparatus according to claim 3, wherein the retention unit is configured to include a protrusion that is provided on one of the apparatus main body and the unit body; and a sloping surface that is provided on the other of the apparatus main body and the unit body, which is not provided with the protrusion, to engage with the protrusion, and

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wherein when a pullout force equal to or larger than a predetermined magnitude is exerted on the unit body, the protrusion climbs over the sloping surface and thus, the retention of the unit body is released from the second position.

6. The recording apparatus according to claim 2, wherein the unit body includes an openable and closeable cover that has the driven roller, and wherein when the cover is open, the driven roller separates from the feeding roller.

7. The recording apparatus according to claim 3, wherein the unit body includes an openable and closeable cover that has the driven roller, and wherein when the cover is open, the driven roller separates from the feeding roller.

8. The recording apparatus according to claim 1, wherein the unit body is mounted on a mounting section that is exposed when an openable and closeable opening/closing body provided on the apparatus main body is open.

9. The recording apparatus according to claim 2, wherein the unit body is mounted on a mounting section that is exposed when an openable and closeable opening/closing body provided on the apparatus main body is open.

10. The recording apparatus according to claim 3, wherein the unit body is mounted on a mounting section that is exposed when an openable and closeable opening/closing body provided on the apparatus main body is open.

11. The recording apparatus according to claim 1, wherein the feeding roller is a roller that inverts the medium fed from a side of the recording head by using an outer circumferential surface thereof, and wherein the unit body includes a second feeding roller of which an outer circumferential surface is in contact with medium transportation paths before and after the medium is inverted by the feeding roller and which exerts a transportation force on the medium.

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